APRIL 1941 Thirty-Five Cents Per Copy

Coal Age

Volume 46 Number 4

"Coal is defense." This is the keynote for the American Mining Congress 18th Annual Convention and Exposition at Music Hall, Cincinnati, April 28-May 2. George B. Harrington, national-program - committee chairman, tells why this is a "must" date on p. 65. Program details start on p. 66. Full report, as usual, in June *Coal Age*. . . . **Pioneer** in mechanical loading, Sheridan-Wyoming Coal Co. continues its modernization program by installing new longer-bar cutters, rubber-tired drills, larger loaders and 10-ton shuttle cars. Chris Shott, general superintendent, and Ray Bottomley, chief engineer, give the story of these changes next month. . . . **The boast** that the coal mine is not a factory no longer holds good. Mechanical mining has made the industry realize that it is as much concerned with a smoothly operating production line as any Detroit auto giant. . . . **Right here**

(CONTINUED ON PAGE 7)

COAL AGE (with which is consolidated "The Colliery Engineer" and "Mines and Minerals") is published monthly on the 1st. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 330 West 42d Street, New York, N. Y.

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Contents

Uncle Sam now mining Potash *in his own backyard!*

Above—3-DRUM SCRAPER loading cars at 900-ft. level.
Upper right—SHUTTLE CAR (on rubber tires) operating from trolley at 800-ft. level.
Lower right—UNDERCUTTING machine with 9-ft. bar.
All machinery is lubricated exclusively with Texaco.

FROM CARLSBAD, New Mexico, now comes potash in quantities that go a long way toward making this Country independent of foreign sources for this valuable mineral.

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TEXACO
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TEXACO Lubricants

FOR THE MINING INDUSTRY

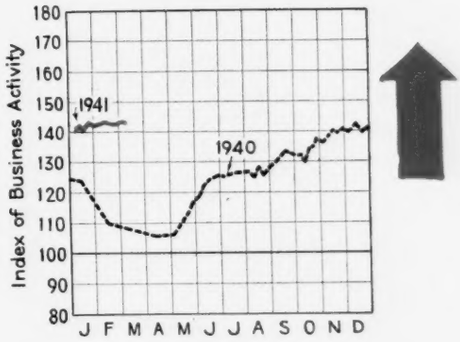
(CONTINUED FROM PAGE 5)

is where management takes a bow—or a brickbat. Because coordination is its No. 1 job. And the more coordination is practiced, the keener the realization that man-power adequately trained is the major link in the production chain. The problems and pitfalls in achieving coordination objectives are the theme of this issue of *Coal Age*. . . . **What does** the industry demand in personnel? Where will it get men? How should they be trained? Wherein lie the greatest opportunities for immediate improvements in operating procedures? What about the future? These are among the questions here discussed by outstanding authorities. And no punches pulled. For details, see table of contents listed on page 5. . . . **Stripping** an 18-in. Oklahoma seam, Seneca Coal & Coke Co. has developed a piledriver-type "pin-machine" to break off the coal and installed mobile underground loaders for its stripped-coal recovery. Charlie Lambur tells the story in an early issue. . . . **Next month,** *Coal Age* will describe operations at Bergoo No. 2 mine, in Webster County, West Virginia. Mechanical and hand loading into scooters net 13 and 10 tons per man-shift, respectively, delivered to main sidetrack. Jack Edwards scribbled his notebook full and used a flock of flash-bulbs photographing the installation. The result is mighty interesting reading.

HOW'S BUSINESS

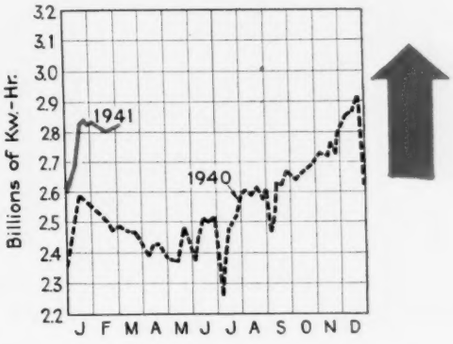
GENERAL BUSINESS CONDITIONS

The *Business Week* Index reacted slightly to 143.9 in the week ended March 15. This compares with 144.2 the preceding week; 144.0, March 1; 143.8, Feb. 22; and 144.3, Feb. 15. With the signing of the lease-lend bill, it is pointed out, we are approaching a war economy—with a large volume of production virtually assured. Defense demand is a guarantee of the direction of business.



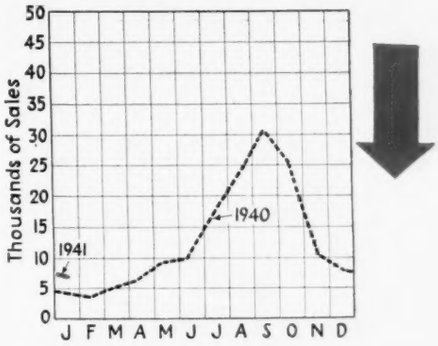
ELECTRICAL POWER OUTPUT

Output of electric energy by the electric light and power industry, according to the Edison Electric Institute, reached the second highest level during the week ended March 8 for any week so far this year, being exceeded only by that ended Jan. 18. Production was 2,835,321,000 kw.-hr., a gain of 15.1 per cent over a year previous. Output figures for other recent weeks are: Feb. 15, 2,810,000,000 kw.-hr.; Feb. 22, 2,810,000,000; March 1, 2,825,000,000 kw.-hr.



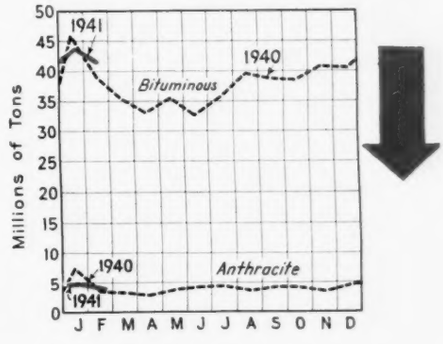
COAL STOKER SALES

Mechanical stoker sales in the United States in January last totaled 5,501 units (U. S. Bureau of the Census from 101 manufacturers), compared with 6,357 in the preceding month and 4,124 in January, 1940. Sales of small units in January last were: Class 1 (under 61 lb. of coal per hour), 4,803 (bituminous, 4,296; anthracite, 507); Class 2 (61-100 lb. per hour), 291 (bituminous, 273; anthracite, 18); Class 3 (101-300 lb. per hour), 236.



COAL PRODUCTION

Bituminous coal produced by United States mines in February last (preliminary) totaled 41,450,0000 net tons, according to the Bituminous Coal Division, U. S. Department of the Interior, which compares with 44,070,000 tons (revised) in the preceding month and 39,277,000 tons in February, 1940. Anthracite tonnage in February last (preliminary) was 4,430,000, according to the U. S. Bureau of Mines, against 4,977,000 (revised) in the preceding month and 3,546,000 in February, 1940.



A Preview of BOWDIL'S NEW CUTTER CHAIN . . .

JIM SLIM says:

Make it a point to see the complete new Bowdil assembly—Cutter Bar, Chain and Bits at Cincinnati Convention, Booth Nos. 243-245.

The new Bowdil Cutter Bar, without doubt, has more outstanding features than any cutter bar on the market. New Z-Bar construction gives it more strength and rigidity than ever before obtainable.

Bowdil leads again!

Twenty years of experience in the design and manufacture of Cutter Bars, Chains and Bits are incorporated in this latest Bowdil contribution to better performance and still lower costs in coal cutting.

Some of the features of the new Bowdil Cutter Chain are:

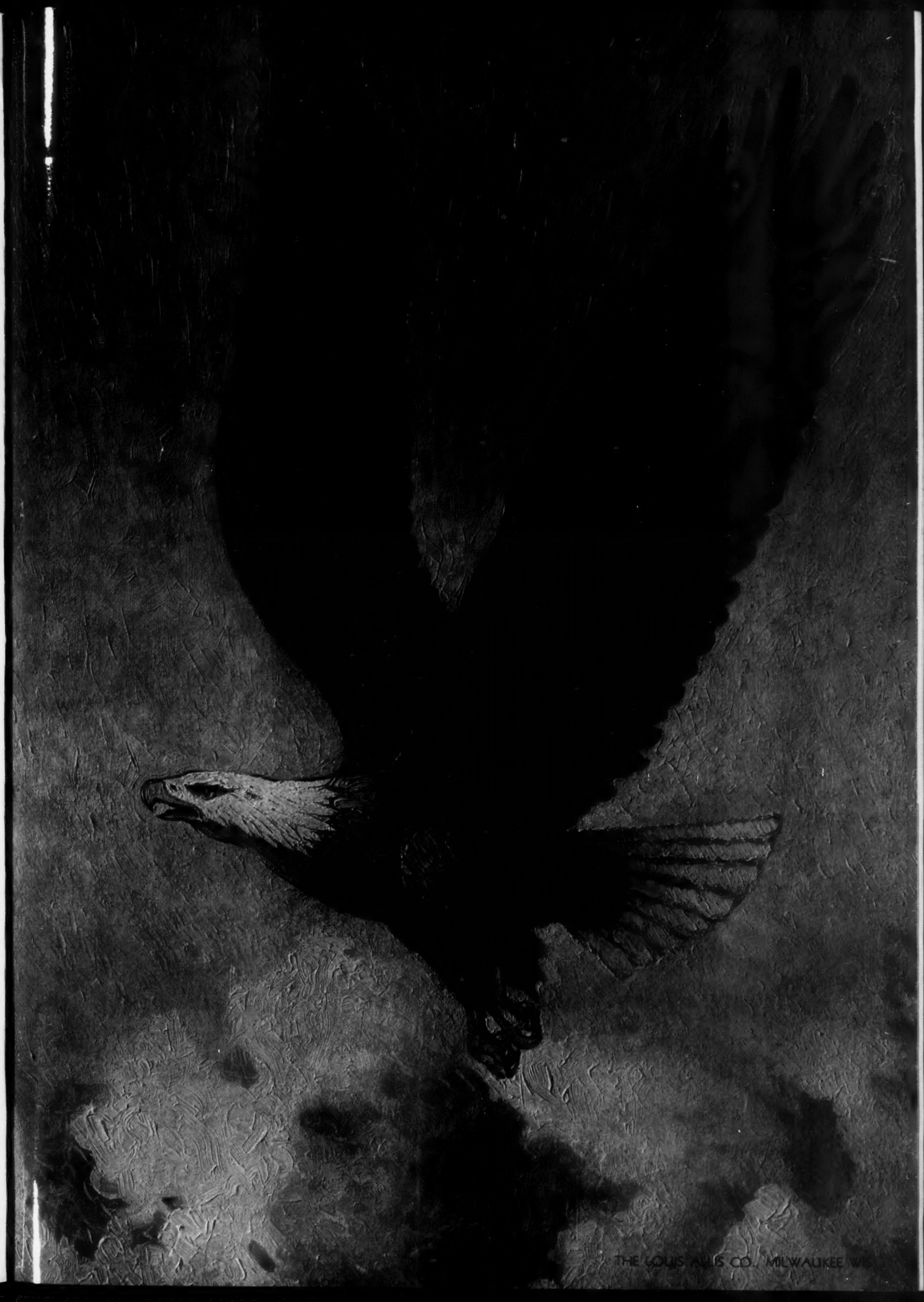
1. Chain circles the cutting head smoothly without damage to wearing strip or jumping at various angles.

2. Connections are made with large, positive pin and bushing connection which can be uncoupled and coupled in one minute.

3. Body section is drop-forged steel, with eye and clevis on opposite ends. This design distributes stresses rather than concentrates them at single members. All are same body section.

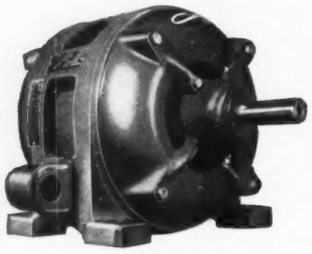
4. Bit carrying lugs are securely welded on as demanded by cutting conditions or results desired.

The BOWDIL Company
Canton COAL CUTTING EQUIPMENT Ohio

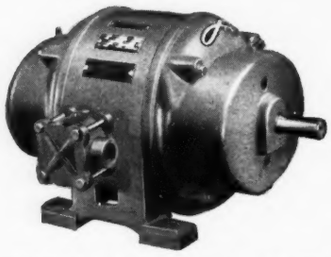

THE LOUIS ALLIS CO., MILWAUKEE WIS.

LOUIS ALLIS

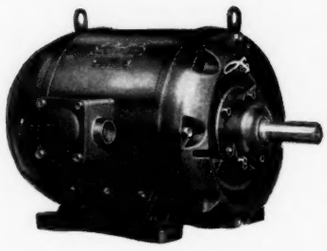
A Size and Type Electric Motor for Every Industrial Requirement



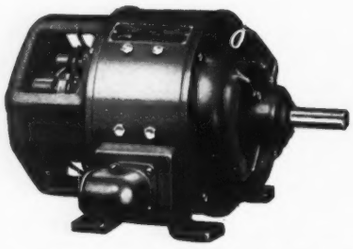
Standard open SQUIRREL CAGE polyphase motors are carefully engineered, precision built motors with rigid construction throughout and adequate insulation you can confidently apply to your toughest jobs.



SPLASH-PROOF motor. Designed and built from the ground up as a real splash-proof motor—full protection against acid spills—splashing liquids—high humidity. Completely protected by cast iron housing.

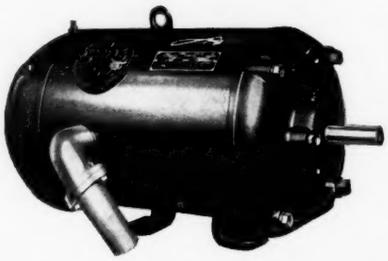


TOTALLY ENCLOSED FAN COOLED motors—for operation in atmospheres containing abrasive dust, corrosive fumes, dirt, oil, combustible dust, and similar conditions such as are usually found in machine shops, foundries, chemical plants, grain elevators, coal pulverizing plants, etc.

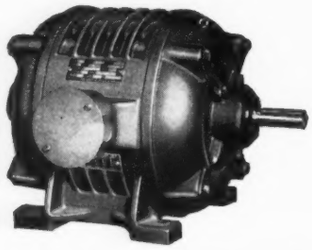


These DIRECT CURRENT motors are correctly engineered and precision built—available in a very wide range of both electrical and mechanical modifications. The extra rugged construction of these motors assures long life of dependable performance.

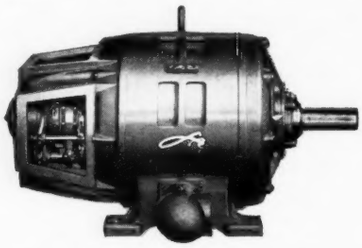
This PROTECTED D. C. motor has the same general construction features of the motor illustrated above. The specially designed protective end bell and armature coverings make this motor especially adaptable for use in coal mines, quarries, or where dropping particles may hit the motor.



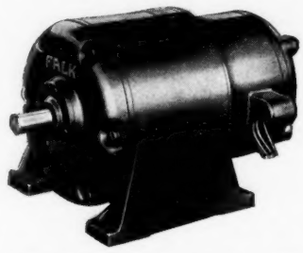
These Direct Current EXPLOSION-PROOF motors have been inspected and explosion-tested by the Bureau of Mines Laboratory. Also tested, listed and appoved by the Underwriters' Laboratories for all Class I, Group D explosive atmospheres.



A complete line of enclosed NON-VENTILATED motors is available in a wide range of mechanical and electrical characteristics. These motors are ruggedly constructed with solid cast iron housings to withstand severe treatment on difficult jobs.



These WOUND ROTOR (slip ring) motors are ruggedly constructed throughout. A wide range of speed variations are obtainable with comparatively simple control. Available with mechanical modifications for every industrial use.



Louis Allis motors can be supplied with a very wide range of various types of gear reducers—integral—all-motor—gear-head—vertical—right angle or parallel—the proper drive for every industrial application.

No matter what your electric motor problem or requirement may be—we earnestly request your inquiry. Your needs will receive our most prompt and careful attention in every way.

THE LOUIS ALLIS CO., MILWAUKEE, WISCONSIN

DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

Coal Age

Established 1911 — McGraw-Hill Publishing Co., Inc.
SYDNEY A. HALE, Editor • APRIL 1941

Men, Management—and Machines

• COORDINATION of men, management and machines is not a new subject. But it is a subject which can never grow old as long as progress is the watchword of industry. Change—swift-paced or slow, but always constant—will prevent that. Every change introduces new problems of coordination and calls for reexamination of basic factors so that coordination may be truly effective. Today, because of the wider adoption of mechanical mining, evolutionary changes easily may develop revolutionary speed.

Coal mining is essentially a materials-handling job. Competitive conditions have made it necessary to do that job more efficiently. Fuel requirements for rearmament will compel still greater and more widespread efficiency if the coal industry is to do its part in the national-defense program. When the country reverts to a more normal economy, competition in all lines of industry will enter a new era of intensification. Victory in the battle of fuels will go to the most efficient producers.

• FOR YEARS it was the boast—and the defense—of the coal-mining industry that "the mine is not a factory." That boast has an empty ring today. True, coal is still where nature stored it. Except in mobility, however, the modern mine is taking on more and more the attributes of a factory. The manufacturing-plant assembly line has become something to be emulated. Thanks to the machine, the industrial revolution has caught up with the coal-mining industry.

Much has been said about how the machine displaces unskilled labor. Too little has been said about the demand it creates for more skillful workers and management. The greater the possibilities of the machine, the greater the need for operators and supervisors who can utilize those possibilities. To

achieve the coordination which spells successful low-cost production, management must have machine-power adequate for the job and man-power trained for the job.

• MAN-POWER properly supervised is still the most important link in the production line. Here the present situation is distinctly critical. Critical because modern mechanical mining demands highly trained personnel in increasing numbers and there is no reservoir from which to draw. For reasons stated elsewhere in this issue, mining-school graduates generally look with disfavor on coal careers. And few companies have comprehensive planned programs for developing men from their own ranks.

This, unfortunately, is not the whole man-power story. Voluntary enlistment in the armed forces of the nation, induction into such forces under the selective-service act, and the financial enticements of other industries all threaten inroads on the man-power now working in the coal industry. These threats are far from imaginary; they strike at and in every category of workers. As the national-defense program grows, such inroads will increase. Dealing with them is difficult.

• QUESTIONS of personnel are inseparable from questions of training. And, since effective coordination is impossible without adequate and properly trained man-power, the issues involved must be faced. Coal mining must be made more attractive to the engineering student. More scholarships in mining schools must be established. Coal-mining executives must develop enough faith and pride in the future of their industry to encourage youth to make coal mining a career.

The schools, too, have a responsibility. Nobody who has delved into the situation recently can es-

cape the feeling that both progressive educators and progressive mine officials are not satisfied with things as they are and are groping for a better solution. "There is," to quote one educator, "such a thing as obsolescence in education as in machinery." If it is necessary to revise text material for extension courses every two years "to keep abreast of the times," what shall be said of resident curriculums in which there have been no outstanding changes in five years?

• EQUIPMENT also may become a major headache for management as the defense program expands. The dream of imposing rearmament requirements on normal business activities without curtailing the latter has been exploded. In abandoning or curtailing a "butter-and-guns" economy, however, there is grave danger of forgetting that coal is basic to national defense. Anything which interferes with essential coal production, therefore, interferes with the progress of the national rearmament program.

Such interference conceivably might come from several sources. Loading mining-equipment manufacturers with armament orders is one. Cutting down the supply of raw materials used in such manufacture is another. Regardless of the particular source of interference, the results in any case would be bad for the nation. Delivery dates for equipment now on order are lengthening, and new orders are piling up. If the mines are to continue to fuel the country with low-cost coal, equipment, supplies and man-power must be adequate.

• THE SHORTAGE in trained personnel is here. A shortage in new equipment and certain supplies is in the making—unless Washington and the industry as a whole take early action to forestall such a development. Priorities in allotments of aluminum, copper, zinc or other raw materials will fail to accomplish their purpose if manufacturers are without sufficient fuel to fabricate the stuff. This is a contingency which cannot be ignored—as those who remember 1917–18 well know.

Alert mine management will weigh both shortage liabilities in its coordination planning for the immediate future. The more carefully it weighs them, the greater will be its desire to effect their liquidation. But this liquidation will require more than static, wishful thinking. Dynamic action is necessary. Directions this should take in meeting the personnel problem already have been indicated. Grappling with the equipment and supply problem will call for much more vigorous attack than has yet been made.

• NEITHER long-time nor short-range coordination can be intelligently planned or executed without searching scrutiny of existing operating practices. Time studies offer the best basis for the start of such examination. The immediate reaction to the results so disclosed, however, may be deceptive. Particularly where comparisons are made in tonnages per man-shift in a mine which has changed from hand to mechanical loading. The increase usually is so great that it blinds many officials to opportunities for further improvement.

How much coal is loaded per machine-shift is not the acid test of efficient coordination. The answer lies in the percentage of total shift-time the equipment actually is moving coal. That percentage for mobile loaders in a widely scattered group of mechanized mines is 48.5. Car changing and tramming used 32.2 per cent of the shift-time. This leaves a segment of 19.3 per cent to be accounted for by management.

• A MACHINE idle nearly one minute out of every five for reasons not directly connected with its operation is a challenge to management's coordinating abilities. That is not all. If the assembly-line theory is applicable to modern mining, the 32.2 per cent of shift-time spent in car changing and tramming also is a challenge. There may be conditions where loading 50 per cent of the shift-time represents the ultimate in efficiency. But no management should accept that premise on faith or precedent.

The answer here, of course, is a sharper appreciation of what coal mining really is—a material-handling job. Too often this basic fact is obscured by a mass of uncoordinated cyclical operations. Bottlenecks relatively unimportant in hand loading become significant barriers to the steady flow of coal in mechanized operations. What happens before and after the loading equipment handles the coal is the real determinant of mechanical-loading efficiency.

Whether considered as a humanitarian or a coal operating-cost problem, accident prevention ranks high in managerial responsibility. The closer coordination and supervision demanded by mechanical mining opens the door to greater improvement in safety records. This is not theory but demonstrated fact. But the improvement does not come by chance. Where effected, it is the result of intelligent planning, continuous attention and wise discipline—the successful coordination of men, management and machines.

• NATIONAL DEFENSE holds the stage today and all of coal's activities must and should be geared to that objective. How long this emergency will last nobody knows. It may be only months—and it may be years. This very uncertainty, however, should spur management thinking on the future of the industry. Unless wise planning is done now, coal may be trapped in the same vortex that almost tore it to pieces after the last war. And that, if at all possible, is something to be avoided.

Return to a more normal way of life, with business activity dependent on peace-time pursuits promises many changes in psychology and methods. Coal can escape some of the disasters of the 1923–29 liquidation by effectively using the machine to take care of present increasing demands for tonnage. But it cannot escape a new world of competition—a world in which efficiency in both production and marketing will be at a premium. How well management accepts and exercises leadership will fix the place of the coal industry in that new world.

MODERN COAL MINING

Demands Better Trained Personnel To Meet Complex Technological Problems

During the birth pangs of mechanized loading, the equipment itself and its mechanical ability to do the job for which it was designed held the center of the stage. Now that this advance in mining methods has been widely accepted, management is discovering that no machine is more efficient than the crew that operates it. Personnel is paramount — personnel to run the machine and personnel to direct and coordinate the efforts of the mine workers. And this situation, as Mr. Morrow points out, lays an acute problem in the lap of management.

By J. B. MORROW

President, Pittsburgh Coal Co.

THERE can be little doubt that we in the coal mining industry are in a transition period where we are attempting to operate machinery with human hands and minds which are not yet adequately trained for the task. Our problem—and it is very acute in the coal mining industry where mechanization is in its swaddling armor—is to keep men and macinery working in harmony as we progress.

Anyone who has been close to the problems of mechanized mining is fully aware that new mechanized techniques demand organization and supervision of a new kind. Men are required who understand the machine as well as the techniques for producing with it, men who can ask for and receive from their gang the properly timed effort that makes the difference between standard and erratic production, men with a knowledge of ventilation and drainage, mining laws, mechanics, and human psychology.

These men are not born, nor are they graduated from the technical schools. They may be born with the native intelligence, they may learn the facts in school or elsewhere, but it is in their training on the job that they learn to integrate intelligence and knowledge with experience.

Not much that is new can be said about personnel problems, but certainly many of the old points are good enough to stand repetition. Nothing that is said here will be startling or even novel, but it is rather a review of some of the major steps the Pittsburgh Coal Co. has taken toward meeting demand for better trained personnel to meet the increasingly more complex technological problems.

An A.I.M.E. survey showed clearly that the coal mining industry would have to offer adequate inducement if it was to get its proper share of engineering graduates. Pittsburgh Coal Co., in an endeavor to accept its share of the responsibility, as well as with a selfish purpose, established a series of scholarships. Early in 1939 the Pittsburgh Coal Co. organized a scholarship competition. Two men were selected and matriculated at Penn State in September of that year. In 1940, two more men were chosen. It is our present plan to continue this until there are eight undergraduates in college at all times, two in each class. The scholarship is an outright grant of $300 plus every reasonable assurance of full summer employment. The applicant must have attained a good scholastic record in high school, be the son of a union employee, and must have good character references. In this connection, it is interesting to note that Patrick T. Fagan, president of District No. 5 of the United Mine Workers, is on the committee responsible for the selection of the scholarship applicants.

Although the practice antedates 1940, in the summer of that year Pittsburgh Coal Co. went whole-heartedly into a program of pre-graduation summer employment. Thirty-three undergraduate students from the various classes in various mining colleges throughout the country were given summer jobs. The most promising of

these boys will be asked to return with the thought that they will upon graduation join the Pittsburgh Coal Co.

A comprehensive training program has been outlined which consists of underground work, shop work, standards department, engineering department, face and tipple preparation, etc., to cover a period of two years. A man who works for the company during three successive summer vacations would, of course, cover between six and nine months of the two-year training period. At the end of the two-year training period these men will have received a broad education in practical coal mining and the company should be in a position to place them according to their particular talents in operation, engineering, preparation, maintenance, or possibly in sales, accounting, personnel, or some other non-operating branches.

Assistants Have Course

A somewhat similar training course has been started for assistant mine foremen; this lasts for only six months, since their wider experience permits a considerable shortening of the training period. At the end of six months the men are returned to production work with the thought that after this training their value to the company will be greatly enhanced. Great care is taken in all of our special training programs to make sure that the "up-from-the-ranks" men are not forgotten. It is fully recognized by the company that the main power of the organization will continue to come from this group and the path of incentive for these men must be left open.

Another plan with which the company is now experimenting is that of bringing men from subsidiary companies to the parent company for training. These men will be returned to the subsidiary companies after the training period with the thought that their usefulness will be much greater, since they understand the problems of the company in addition to those of their particular subsidiary. This training, of course, applies more particularly to the outside operations, emphasizing such problems as preparation, maintenance, and allied work, although the sales department has drafted men from operations in the past and undoubtedly will again in the future.

It is the policy of the company to promote from within rather than to draft men from the outside when a good opening in the company is available. In order to prevent the company from becoming too ingrown, it has been the policy to send quite a few men to various meetings and conventions such as the American Mining Congress, American Management Association, American Institute of Mining and Metallurgical Engineers, Stevens Institute, and Ohio State Short Courses, visits to other coal mining properties, sending mechanics to manufacturers' plants for training, encouraging membership in various societies and organizations, and similar outside activities.

Modern mechanical mining demands organization and supervision of a new kind. Native intelligence and technical education, however, will not alone meet this demand. Something more is still required. That something is training on the job where capable men can learn to integrate intelligence and knowledge with experience. How Pittsburgh Coal has set out to create the better-trained personnel necessary to cope with the increasingly more complex technological problems of the day is described in this article.

In order to bring the entire company together the company follows the usual practice of holding staff meetings for this purpose. At regular intervals superintendents' dinners are held at one of the larger hotels in Pittsburgh, at which various matters of company policy, practice, or new ideas are inaugurated and discussed. Each mine holds its own staff meetings regularly, and the superintendents have staff meetings every two weeks with the manager of the division, at which the usual operating matters are discussed.

Much effort has been devoted to encouraging the production department to draw more heavily on the staff departments by emphasizing that coal mining has become such a technical enterprise that it is no longer practical to expect the mine superintendent to be a specialist on lubrication, mechanics, personnel, layout, drainage, ventilation, and all of the other problems which mine supervisors are called on to face every day. In turn, the staff departments have been especially coached to "sell" their services rather than to act as arbitrary agencies with the right to insist or demand that the superintendent do certain things in certain ways which are most pleasing to the staff departments.

The discussion above has dealt only with the long-range policy matters which do not pay dividends "on-the-line" but are the broad approach to the personnel problems of next year, ten years, and twenty years from now. We have not touched on union relationships and grievances, delegating authority, training understudies, and the numerous problems of immediate importance, although we have, of course, but emphasized and reemphasized their importance to our men.

TIME-STUDY SURVEY

Of Loading-Equipment Operation Highspots Value of Effective Coordination

"How much tonnage does the machine load per shift?" is an interesting question. But what percentage of shift time the equipment actually is loading coal is really important. The answer to that question tells how good a job management is doing in coordinating all phases of the operating cycle. Lost time may be unavoidable, but no executive should so classify any delay until he has probed its causes. Time studies give the basic data upon which to start such an examination.

TODAY all industry strives to coordinate men, management and machines for national defense. Tomorrow, though the basic problem will remain, its objective will have changed to the economic phase of meeting post-emergency competition.

Now and "for the duration," coal plays a major role in the national production spectacle. Afterward, the "tomorrow" of post-war conditions, coal's fitness to rebuild its wider markets and retain its claim as chief supplier of the nation's heat and power will depend upon its ability to increase output per man employed at lower cost per ton.

This ultimate objective can be attained only with trained men, utilizing modern machinery and equipment, in production cycles coordinated to existing physical conditions, by scientific management.

Indications of coal's ability to do this job is found in the records of gradually increasing tonnage output per man through the years, with each successive increase directly reflecting the results of better management and equipment. Application of power mechanisms in mining has steadily decreased the amount of human labor expended in producing coal and is rapidly converting the workers into highly skilled specialists who control and direct the operation of mechanical equipment designed to accomplish efficiently all former manually performed tasks.

Though improvements in every phase of the mining cycle from face work to cleaning plants have contributed toward greater output per man employed, by far the greatest impetus occurred in the change from hand to mechanical loading. Machines rapidly supplanted animals in surface stripping and loading, to give this recovery system the first completely mechanized operation in coal mining. Deep mining, with proscribed physical conditions of narrow widths and low working clearances, was slower in adopting mechanized loading methods, but by 1920 commercial machines were being developed and in 1923 a sufficient tonnage was so loaded that governmental records of annual output were instituted. Since that date the growth of mechanically loaded tonnage in the United States has reached a figure approximating 45 per cent of the total coal output.

Commencing with the application of large-size mobile machines installed under the most favorable circumstances, loading equipment has now been developed to meet generally difficult physical mining conditions. Today proof is available that, regardless of detrimental factors, some form of mechanized loading is adaptable to every physical seam condition.

Wide use of power equipment to increase production per man was not a simple outgrowth of wishful thinking. It has been developed slowly by the analysis of mining conditions and equipment design in relation to coordinated manpower for balanced operating cycles producing the greatest output per employee at the lowest possible cost.

Though great progress has been made in mechanized loading to date, the future holds still greater promise. Where unit records of 100 to 200 tons per shift were once proudly cited, daily averages of 300 to 400 tons are now commonplace and the ultimate is not yet in sight.

Productions per man-day do not rise without a corresponding increase in cyclic coordination. All machines and manpower entering into the complete operating cycle, before, during and after mechanized loading, must be exactly balanced to give lowest production cost.

With the advent of daily report forms recording shift tonnage output and number of men employed on each crew, tabulating and accounting methods were instituted to definitely peg fractional costs per ton for loading-unit shift comparisons. Such comparisons definitely point to the degree of coordination reached by each crew each shift, under known operating conditions, and the general pattern for increased efficiency is developed.

In some mines scientific analysis of operations is a major part of the modernizing program, while in others a smug satisfaction at having reached a lower cost than ever before—or a cost below that of adjoining mines—

descends like a blanket to cover many otherwise obvious sins of omission, whereunder lie hidden many additional cost economies.

Time studies of operating phases reveal discrepancies in individual machine cycles as well as the unbalancing effect, or lack of coordination, with other machine cycles. Simple to record and interpret, time studies have long been used in many industries to establish bases for economic production. The increasing use of power mechanisms in coal mines, the magnitude of such capital investments from which adequate returns are expected and the future security and well-being of all employees, now demands a continually increasing coordination of manpower and machines. Time-study data, correctly recorded, interpreted and used as the basis for indicated changes in operating procedures, point the way to many additional economies in modern coal-mining technique.

Though physical conditions and type of equipment vary widely, even in the same immediate producing area, the lack of machine-capacity utilization also varies widely. Performance records run the gamut from high output per man to low and, necessarily, from low to high costs per ton.

To indicate roughly discrepancies of shift-time usage in mechanized properties and to gage the general degree of over-all possibilities which might exist for aiding the present national emergency, *Coal Age* asked a selected list of mobile loader, conveyor and strip-mine operators several basic questions regarding their primary coordination.

Underground Operations

Questions to underground operators were:

What type equipment do you use: mobile loaders or conveyors?

Into what type transportation is your coal discharged: mine cars, conveyors, shuttle cars, or special?

What is the average percentage of shift time your mobile machines are loading coal?

What is the average percentage of shift time your mobile machines are moving from place to place?

What is the average percentage of shift time used in changing behind machines?

What is the average percentage of shift time your conveyors are moving coal?

What is the average percentage of your conveyor shift time spent in face preparation and clean-up work?

Eliminating the few returns from mobile loader operations showing the highly idealistic shift performance of exactly 100 per cent for the three basic cycles of loading, car changing and moving from place to place, returns ranged from a high of 90 per cent to a low of 30 per cent of total shift time.

Results of the mobile loader survey gave the following averages: Loading coal, 48.5 per cent; changing cars behind the machines, 20.0 per cent; moving machines from place to place, 12.2 per cent, to total a necessary operation's shift time cycle of 80.7 per cent. Deducting this figure from total shift time, an unnecessary time loss of 19.3 per cent is indicated. Conversion of shift time lost in unnecessary delays into dollars and cents lost per shift naturally varies with size of unit crew and basic wages paid.

Conveyor loading ranged from a low of 26.7 per cent of shift time actually moving coal to a high of 70.0 per cent. Average time moving coal was 52 per cent; face preparation and clean-up work averaged 24 per cent, with resultant lost shift time indicated at 24 per cent.

The possibility of only a small percentage conversion from shift time used in face preparation and clean-up work to moving coal holds promise of increased production per man, while the elimination of all shift time lost in other than moving coal, face preparation and clean-up work could add slightly more than 1½ hours to productive time of the loading crews.

Unrestricted by height and width of working clearances, but limited at the present time by the depth and character of overburden possible to move economically, a selected list of strip operators were asked the following questions relative to their average distribution of working shift time:

What type equipment do you use for overburden removal: shovels, draglines or special?

What is the average percentage of shift time your machines are stripping overburden?

What type equipment do you use for coal removal: shovels, special?

What is the average percentage of shift time your machines are loading coal?

What type transportation do you use from pit to cleaning plant: trucks, cars?

What is the average percentage of shift time lost in waiting for equipment into which to load coal?

Stripping Operations

Answers to questions concerning stripping overburden ranged from a low of 65 per cent to a high of 95 per cent of total shift time, with the average equaling 80.6 per cent. Deducting this figure from total shift time, an average of 19.4 per cent is indicated as lost operating shift time in stripping.

In loading stripped coal the percentage of total shift time consumed in the operation ranged from a low of 55 to a high of 95 per cent, to give an average of 80.5 per cent. Time lost in waiting for equipment into which to load the coal ranged from a high of 30 to a low of 1 per cent, with an average of all returns equaling 11.8 per cent.

Combining the average loading and waiting-for-transportation percentages, total shift time so occupied ranged from a low of 65 to a high of 98 per cent, to give an average of 92.3 per cent. Deducting this average percentage from total shift time, a loss of 7.7 per cent of total operating shift time is indicated. Eliminating both time losses consumed in waiting for means of transportation and those unspecified, a total of 19.5 per cent of total shift time is shown.

An interesting comparison of deep-mined mechanical loading and stripped-coal loading performance is given by the survey, with the former recording an over-all lost shift time of 19.3 per cent and the latter method 19.5 per cent.

Unaccompanied by the hundreds of explanatory details which might have pointed out the reasons for over-all delays shown in each return, these average operating lost-time figures are submitted to *Coal Age* readers for consideration.

LOADING EFFICIENCY

Depends on What Happens Before and After Machine Moves the Coal

SUCCESSFUL mechanical mining means employment of production-line operating technique. The loading equipment, of course, has the key place in the production line. How efficiently it functions, however, is dependent upon how well the phases of the operating cycle which precede and follow the handling of material by the loading equipment are coordinated. Any delay in the production line affects loading-equipment performance. And the causes of such delays may be remote.

The sections which follow highspot some of the essentials to smooth operation. They point out steps which may be taken by management to forestall interruptions in loading due to delays at the face and stoppages because operations are not geared to take coal from the loading equipment as fast as that equipment can take it from the face. Obviously, space limitations do not permit detailed discussion of any phase. The treatment here is necessarily suggestive.

Face Preparation

WHILE the ultimate goal is combination mining and loading machines, present-day mechanical equipment must have loose coal to function. This means making cutting, drilling and coal-breaking integral parts of the extraction cycle, although cutting may be eliminated in certain regions. And since mechanical performance depends, among other things, on the quantity of coal in a single pile and how easily it can be picked up, maximum coordination of face-preparation methods with the loading system is an absolute necessity.

Balance between the productive capacities of face-preparation and loading equipment, particularly where mobile loaders are employed, is an essential factor in coordination. If the cutting machine can't keep up with the loader, productivity suffers or an extra machine and labor must be employed. Elimination of this direct loss may well warrant purchasing higher-capacity shortwall equipment or the substitution of mounted machines with their usual higher inherent capacity.

Even with conveyors, scrapers and similar equipment, higher-capacity shortwalls may raise efficiency by lengthening the time available for loading. On the other hand, reduced-horsepower under- or overcutters may provide satisfactory performance with a lower initial cost where cutters are stationed in every place. Or installation of caterpillar-mounted or rubber-tired trucks to permit moving a standard high-capacity machine from place to place may enable it to do the work of several individual units.

Where existing cutting equipment otherwise is satisfactory, several means of raising its capacity are available, including increasing feed speed; hard-surfacing bits or using special alloy types to increase tons cut per point and reduce setting time; and installing longer bars. This presupposes keeping the load within the motor rating, in which tipping or alloy bits, among other things, may be helpful. Or special insulating materials capable of withstanding higher operating temperatures may be employed.

Where such revisions still do not provide proper balance, higher-capacity equipment may be necessary, such as new type shortwalls and mounted machines. The latter normally provide quicker moving and setting up, and in addition, depending upon the type, may offer several other advantages, such as cutting out bands, top cutting to protect roof, and shearing to increase lump, reduce explosives requirements and heighten loadability.

Lengthening cutter bars should receive serious consideration in every mechanical-mining installation. Where conveyors, scrapers and similar equipment are employed, the deeper the cut the less often the cutting cycle must be repeated and consequently the greater the time for loading. With mobile loaders, the fewer the machine moves the greater the output—also a major argument for long-face or longwall work. But moves may be reduced in room-and-pillar or similar work by increasing the tonnage per cut or fall. One good way is lengthening the cutter-bar.

Balanced productive capacity is just as important with drills. With certain equipment and coals, hand-held drills do a satisfactory job. Where the duty is heavier, higher-capacity post equipment finds a field. Beyond that, for still greater capacity

and harder cutting, the mounted drill (wheels or rubber tires) finds a growing field. New styles of augers, especially the conveyor type, and cutting heads with throwaway-type alloy bits reflect the advantages of smoother operation and greater productivity.

Drilling patterns naturally vary widely. In this connection another advantage of longer faces is fewer corner shots, cutting powder consumption and raising coarse-coal yield. In the thicker seams, good results are obtained from snubbing holes, frequently with a faster breaking medium, to throw out the bottom part of the seam, thus easing the burden on the top holes and getting good breakage and a high lump yield with less force. This is particularly true where mobile loaders are used. And with mechanical loading, thorough bugdusting, good stemming, correct positioning of holes to even the burden, etc., take on added importance.

Coal-breaking mediums available to the mechanical miner range all the way from common black powder to air, carbon dioxide and hydraulic or mechanical pressure. Increasing stress is being laid on newer permissibles to meet mechanical-mining conditions, particularly where cuts are deep or other conditions tend to unbalance horizontal and vertical burdens. Air and carbon dioxide have been called upon by an increasing number of operators using mechanical equipment. Both have demonstrated their ability to pull efficiently deep cuts in thin coal while providing good lump and loadability. To these other mediums has been added hydraulic pressure, which permits breaking without shock with the men at the face, and assures a high coarse-coal yield.

Transportation

NO LOADING equipment can be more efficient than the transportation system which serves it. This is true even in hand loading into cars, although with tonnage payment the effect of transportation deficiencies on cost may not be so noticeable. But with mechanical mining and day-wage payment, a transportation interruption means a direct loss because wages and certain other costs go on even though production ceases. Transportation, therefore, rates first place in management thinking if machines and their operators are to function efficiently.

Continuous functioning is the ultimate goal in transportation. Conveyors provide the closest approach, and when hand loaded are purely transportation units, even though commonly considered mechanical-mining equipment. Conveyors also reduce the lift in hand loading, and the value of this reduced lift, plus continuity of operation, is reflected in their rapid growth in late years. Reduced lift and availability for transportation when needed also are characteristic of other hand-loaded mechanical equipment, such as hoist-operated haulers (or scrapers), scows, etc. Elimination of taking of top or bottom is another major advantage of these transportation units at many operations.

Certain self-loading equipment (scrapers, shakers with duckbills, etc.) also performs a transportation function. Thus, these units complement the main-line transportation system, usually based on cars and locomotives. In several instances, however, the value of continuity of service, plus other advantages, including elimination of brushing, have warranted mother belts on room entries. And at several properties, main-line and slope belts take the coal to the tipple.

With conveyor, scraper and similar equipment, cars normally are loaded in trips and thus their size is not so great a factor in performance, although even here the bigger unit has its advantages. In loading into cars with mobile machines, however, size exerts a direct influence on performance. Thus, the bigger the car, the fewer the changes required for a given tonnage. Consequently, more time is left for the actual productive operation—loading.

But while car size is a vital factor and substantial investments may be warranted to secure it, other aspects of loader service should not be neglected. Changing distance should be kept short and changing locomotives should not be required to do other work better left to relay units. Two locomotives frequently will boost loader output by cutting still further the changing interval.

Shaft size, however, may limit the size of mine car hoisted. But the operator still has a choice between rubber-tired haulage units and large drop-bottom cars plus hopper and elevating conveyor for transferring the coal to the regular mine cars. A number of successful installations of conveyors behind loading machines are in service. While they function continuously, the size required for necessary capacity in some cases makes them unwieldly. Moving them also may be quite a task, and if shooting on the shift is prohibited the number required to keep a loading machine in full operation materially increases the investment. Consequently, the trend has been toward large cars or rubber-tired equipment.

Riding on Rubber

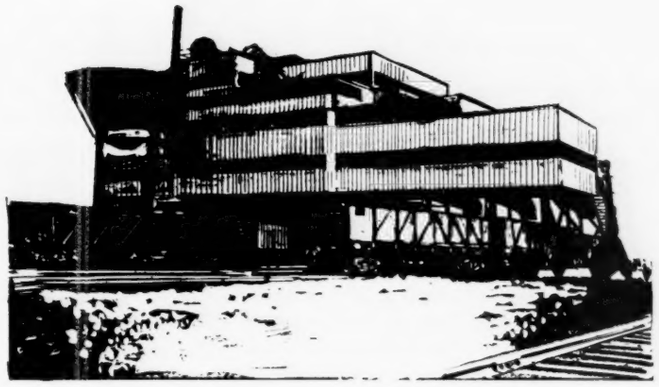
Rubber-tired units, which eliminate track but require special facilities for moving cutting machines, drills, etc., provide large capacity. And, since two or more units normally are used behind a loading machine, one always is ready to go in when the other pulls out, reducing changing time to a minimum. Two or more changing units per machine also is the rule where drop-bottom cars in capacities up to 10 tons are used with transfer stations.

Much more might be said about service to face men or equipment, but other transportation stages also are important in promoting efficiency. Bottlenecks at shafts, for example, might be eliminated by improved automatic caging equipment, speeding up the hoist, using skips or increasing the size of existing skips or even a complete new hoisting installation. In some cases, a new belt slope may be a well-paying investment.

Main and secondary haulage underground is equally important because wrecks or delays stop mechanical-mining equipment. Sufficient cars

are a must item and locomotives should be adequate in type, size and speed to deliver them where and when needed. In larger operations, dispatcher distribution usually returns several times its cost.

Good dispatching, wreck prevention and speedier operation may in fact render unnecessary additions to equipment. One of the best wreck preventers is heavy steel on a well-drained and ballasted roadbed with long-radius curves. Good timbering, which keeps slate, bars, etc., off the track, may well warrant timber treatment, use of hitch drills and other modern aids to better roof support. Grading to cut down hills may well be the difference between, for example, operating with one or two locomotives. Other means to efficient low-cost haulage include such items as treated ties, steel ties for reinforcements or the entire tracklaying job, welding of rails, automatic or manual signal systems, etc.



Surface Preparation

SATISFYING the consumer naturally is management's goal in preparation and has been the major factor in developments in late years. But preparation also is dependent upon the mining system, and changes here have vitally modified practices at many plants. Where mobile loaders are installed, for example, efficiency usually dictates handling everything in the seam, unless impurities can be eliminated by cutting out partings, bench mining, etc. Many strip operators also find it more convenient and economical to transfer cleaning from the pit to the preparation plant. These factors, aside from the machine's ability to improve small sizes and guarantee uniformity, are powerful arguments for mechanical cleaning. But, depending upon character and volume of impurities, hand picking can—and does—provide a quality product at many plants.

This, however, is only part of the story, as changing market conditions and public demand for greater efficiency and convenience have made other activities equally important. Consequently, late years have witnessed the growing use of crushers, breakers and stoker-coal sizers; auxiliary screening plants using vibrating, high-speed shaker and other sizing equipment for making the more popular junior sizes and removing dust; magnetic pulleys and stationary magnets for removing tramp iron; oil, chemicals, oil-chemical compounds and other materials for rendering shipments dustproof, etc.

Further tailoring of the product to the consumer's needs is assured by the almost universal use of mixing equipment, while an increasing number of operations have installed special blending plants consisting of storage bins, proportioning feeders, mixing conveyors and special loading equipment. Few plants are without degradation screens.

To improve quality and uniformity and better handle the problems resulting from mechanical methods, management at a growing number of operations has gone to mechanical cleaning for part or all the product. Thus, loading machines are permitted to function as they should, cleaning is extended to those sizes impossible to hand pick, and erratic results are eliminated through the inherently higher uniformity of machine processing.

The possibility of savings in picking has been a major factor in the installation of numerous cleaners for coarse sizes, as well as an increase in top size cleaned in washers in late years to 6- to 8-in. And where picking still has been found satisfactory and economical in preparing coarse sizes, a desire for higher quality and greater uniformity has been responsible for the adoption of numerous mechanical units for screenings, stoker and other small sizes. The cost of mechanical cleaning, compared with the cost under hand methods, particularly where picking requires substantial outlays for labor and equipment, normally is quite reasonable considering its many advantages.

Management now has a wide choice between self-contained cleaners for small tonnages, wet or dry units for individual sizes, washers or air cleaners for screenings or coarse coal or both, wet and dry tables, and other more or less specialized equipment. Automatic controls govern the performance of many types. Re-treatment of middlings, after crushing, is growing, with more attention to the recovery of fines in wash water and their beneficiation by flotation, centrifuging, etc. Large raw-coal blending plants have been built to iron out fluctuations in impurity and size consists and thus raise cleaning efficiency.

Dryer Installations Increase

Washing of screenings, at bituminous mines, has posed, in many cases, a freeze-prevention problem. Some operators, therefore, bypass fines. Others use dry cleaners for the fines and wet for the coarse coal. Where all screenings are washed, freeze preventers include calcium chloride. Other operators consider wet washing of screenings sufficiently advantageous to warrant auxiliary drying equipment. Heat and centrifugal dryers, therefore, have sharply increased.

To insure efficient and continuous operation, promote safety and facilitate maintenance, many modern preparation plants are distinguished by steel and concrete construction; large shafts and bearings—many of the anti-friction type; improved sleeve or anti-friction-bearing motors; well-designed speed reducers; V-belt, gear and chain drives; efficient lubrication systems with, in several instances, semi- or full-automatic equipment; hand- or stoker-fired boilers and unit heaters; plenty of windows and skylights; up-to-date artificial lighting systems, including mercury-vapor or fluorescent picking lamps; wear- and

corrosion-resisting steels at logical spots; etc. A few have embraced complete dustproof construction with vacuum-cleaning systems, while a growing number facilitate maintenance by installing oxygen and/or acetylene lines and welding circuits.

Power circuits normally are protected by conduit, with conductors in some plants large enough to permit doubling or quadrupling the load. Dust-tight starting equipment is receiving increased attention to prevent failures from dirty contacts and promote safety. Pushbutton panels with interlocks to prevent spills are usual in plants with 20 to 40 motors, with full-automatic sequence starting in many larger operations. Transformers are being placed closer to load centers where the demand is large. This is facilitated by non-inflammable liquids which permit setting them inside the structure close to the distribution board. Synchronous motors and other power-factor-corrective equipment are more widely installed to offset the influence of induction-motor loads. The use of 440 volts in many plants reflects the better voltage regulation afforded.

The importance of controlling preparation results for maximum efficiency in coal use is reflected in the widespread installation of completely equipped mine laboratories adequately staffed with chemists, samplers and other expert help. Sampling itself, which vitally influences all the succeeding steps in securing a final analysis, is being mechanized with automatic equipment at more and more plants for accuracy and efficiency.

Power Distribution

ALTHOUGH power is a significant item on most mine statements, its cost at the face is a decidedly secondary item when compared with the cost of delays and slowing down of operations resulting from interruptions and low voltage. This is particularly true of mechanical operations, where production depends entirely on how the machines operate. In addition to its other disadvantages, low voltage causes motors to overheat, resulting in still further interruptions as well as increased maintenance. The fact that good power is easy to provide makes such conditions even more indefensible.

Maintaining good voltage may warrant purchase of portable instruments. Curing poor voltage requires essentially keeping substations close to the working section (normally not over 2,000 ft. away), plenty of copper (1,000,000-circ.mil feeders to within 500 ft. of the farthest working place is a good rough rule) and a good return, meaning efficient bonding or welding and, usually, auxiliary returns of as high as 1,000,000 circ.mils or more. Regular drilling of boreholes or portable sets underground are good methods of keeping substations up. Full-automatic stations are desirable in many cases, as is sectionalizing of the d.c. system, in which automatic reclosing breakers may render efficient service.

With distribution in good shape comes consideration of the efficiency of conversion equipment. While rotating units still may be chosen for certain applications, rectifiers may save $100 or more a month. On the a.c. side, unless State laws prohibit it, raising voltage to 4,000 or more is perfectly feasible as a means of cutting losses and bettering regulation.

Mines using 220 to 440 volts for operation of underground equipment are increasing, with 220 far in the lead. This requires transformers close to the face, and the use of new low compact units with non-inflammable liquids should eliminate much 220-volt trouble in addition to promoting safety. With a.c. for other equipment, only haulage remains for d.c., which should lead in many cases to an investigation of battery service.

Underloaded a.c. motors increase power cost and disrupt voltage regulation without proper attention to power factor. Some obvious remedies are better matching of motors and loads, use of synchronous equipment where possible and installation of static or rotating condensers, which also reduce maintenance by reducing motor heating. Transformers up close also help. Separate smaller conversion units or transformer sets might be a good investment for idle-day use to eliminate the losses encountered in running the regular units under light load. An alternative in the case of d.c. is battery equipment.

Maintenance

WHEN equipment breaks down, production stops. No better argument for good maintenance, particularly of the preventive type, can be offered. And, aside from efficiency and low-cost operation, a machine in good shape is a safe machine. Thus management and men both have a double-barreled reason for keeping up equipment.

System is the keynote in good maintenance, and should extend to inspection, lubrication and regular overhauling or checking of equipment. Report forms are a necessary adjunct to systematization and, particularly at the larger operations, provide about the only means by which supervisory officials can ferret out weak spots in maintenance work and determine whether changing certain operating conditions will improve the situation. While others may be desirable, the minimum should be a form for reporting lubrication, a form for the machine operator to report difficulties and make recommendations for repair work, and a form for the repairman on which he can list his activities.

When and how to inspect varies with the type of machine or part and the duty. In some cases, inspection quite profitably can be combined with lubrication. Skilled men for inspec-

tion are a necessity. In fact, an adequate force of skilled maintenance men is a major necessity at mechanical-mining operations. Another important item sometimes overlooked is an adequate supply of maintenance tools and equipment. Lack of a single screwdriver of the right type, for instance, might keep a machine shut down an hour or more while another was being secured. Convenient, well-heated and well-lighted quarters also improve maintenance. A top shop with 10 or 15 machine tools, for example, might be of less service in keeping machines running than an underground shop with pit and adequate crane or chain blocks. Welding equipment is a very essential item, and, if made portable, may save many hours in machine delays.

Keeping a machine shut down while a part is brought in from the outside points a self-evident moral—be sure an adequate supply of parts frequently needed are in the working sections. Reconditioning such an assembly as a head or rear conveyor and then exchanging it as a unit is another item conducive to maximum efficiency. Many operators find that complete spare machines are a paying investment. Standardization of machine types naturally cuts part inventories and facilitates maintenance.

Operating continuity also has been favored by a number of new aids in recent years, such as high-tensile, corrosion-resistant and wearproof alloys, asbestos and fiber-glass insulation, insulating compounds with a longer life in the presence of heat, light, moisture and oil; non-inflammable insulating and cooling liquids, improved lubricants and lubricating equipment, anti-friction bearings, etc.

Ventilation

FEW mine phases are as much neglected as ventilation. What mine would be operated with a loss of 40 per cent of its electric amperage? But a mine often loses that proportion of its air to the return along the length of the roadway and, in that event, it wastes about 66 per cent of the air horsepower that the fan supplies. Except where a mine has to ventilate idle rooms, only the air that dodges the leaks and reaches the working places produces any useful effect.

At only too many mines, the main fan at the surface draws contaminated air from the nearby return back into the mine for another swing around the circle. Air fouled at the mine mouth with methane, dust and carbon dioxide from the mine and with dust from the tipple is of little value for the ventilation of the workings. The safety lamp knows the difference between good and bad air, though the anemometer does not. Less air usually will suffice if the air is clean when taken into the mine.

Not all leaks are to the return; some lead to the surface through crevices in shaft, drift or slope, and some through outcrop holes. Leaks *into* the mine, however, may be helpful if they lead to intake passages. Sometimes they so shorten the air travel as to suggest the establishment of a point of intake nearer the working face.

Though mine cars must travel with their solid burdens back and forth from end to end of the mine, most of the air, or all of it, need not travel so far, only a little air being needed in the main haulageways which give access to the headings in the working sections of the mine. To relinquish or relocate a mine for the purpose of limiting its car haulage may involve a heavy expenditure, but a reduction in air travel by an advance of the fan, like a shortening of electric circuits by an advance of a substation, is a simple and almost universally prudent procedure, especially where the coal crops.

Some companies working in a badly furrowed terrain move their fans and change their adits and exits every few years. Sometimes it is "preferable to move than to clean up," to leave fallen airways behind than to rid them of fallen rock, timber them and mend brattices. Such a move also provides more and shorter ways by which men may escape to the surface in the event of a disaster.

Misplacing of auxiliary fans so that air laden with fumes, methane, coal dust and blackdamp is recirculated is dangerous and a waste of power. But proper placing of such equipment promotes efficient ventilation at the face. Revolutionary changes in fan construction that make for higher efficiency, greater portability and a wider range of volumetric capacity with a minimum fall in efficiency and lowered first cost have made operators more ready to recast their ventilation systems. Even when speeded, the fan of a mine's earlier years rarely can supply the air needed in the mine's maturity, with or without efficiency, so it is better not to try to provide a fan to serve both a mine's youth and its middle age.

Roof Support

ACCIDENTS exact a triple toll from the industry. Men suffer injury, death and losses in income. Hospitalization and compensation add to the cost of production. Every accident means some interruption to orderly operating procedure, and the delays so incurred are inimical to efficient coordination for high-speed mechanical mining.

Since roof falls are the principal cause of mine accidents and fatalities, proper roof support is vital to economical operation. This demands adequate, systematic timbering. Whether this adequacy be determined by the trial-and-error methods of experience or by laboratory experiment backed up by field tests, the cardinal principle is the same. Only by adequate timbering with an ample factor of safety is proper roof support assured.

Examination of the roof visually and by sound often is quite an unsatisfactory clue to the condition and may encourage too little timbering. To induce miners to erect promptly a sufficient number of posts, temporary or permanent, their setting should be made as easy as possible. They should be of the right length and properly squared at the ends.

Ready-made cap-pieces of the right size, length and bevel also should be provided. These accessories should be furnished ready for prompt installation, not only to prevent saw and ax injuries but to get timber set. Some companies are doing better, providing patented safety posts that are even more easily erected. But, with

mechanical loading, it will be necessary in many cases to provide steel or aluminum crossbars, though just at present the latter metal is difficult to obtain and may be prohibited for civilian uses.

Timbering costs in rooms may be greatly reduced if places are advanced rapidly, so that the timbers can be removed promptly and not left to rot. If the breakline is straight and so planned as to be beyond the point of car loading at the end of each pillar, the weight will be taken by the pillars and not by the posts. If posts have to sustain a heavy, crushing weight, they should be cushioned by a 4-in. block of soft wood.

Steel Jacks Help

Steel jacks cushioned with timber have been found of great help where the faces of the longwall workings have to be supported temporarily. Mechanical releases provide for their rapid recovery. Power prop pullers operating at a distance are now constructed that pull out several posts at a time and thus prevent accidents. Locomotives are sometimes used, but many are using ratchet devices which are far safer than axes or sledges, but these primitive means sometimes are still in use where the law allows.

In roads, cross timbering will be less frequently dislodged and less obstructive to ventilation if hitched into the rib near the roof. Though this is quite a general practice in Indiana, the East has not proved receptive to its introduction. Gunite gives an even smoother surface, adequate protection against weathering, and longer life. Paint has been little adopted, but, where tried, results have been most favorable.

Timbering that is intended for any degree of permanence should be treated with preservative. Even where timber has only a temporary purpose, if it can be withdrawn without breakage, it may pay to impregnate it against decay. Good pillars along roadways will make it possible to use less timber and will prove a good investment. Air conditioning will keep the roof dry and thus reduce rock expansion, which is the cause of so much roof failure. This practice, like hitch drilling, has not moved East.

Roof control is a subject upon which new light is constantly being thrown. Laboratory studies of barodynamic pressures with small-scale models of actual roof materials challenge many preconceived notions of what constitutes proper roof support. Application of the results of such studies to field operating practice is still very much in its infancy. In the few instances where such application has been made, substantial reductions in timbering costs have been effected.

Stripping

STRIPPING is the most highly mechanized of all coal-producing methods. Investment in individual producing units is high, more highly skilled men are required to operate and maintain them and consequently management needs be more alert in all departments to eliminate interruptions which reduce tonnage and increase cost. This extends to such items as staking cuts, power supply, preventive inspection and maintenance, drainage ditches and dams, sumps and pumping equipment, conduct of stripping to prevent slides or adoption of special equipment, such as large tractor-powered scrapers, to clean them up while letting regular stripping and loading units keep on. The same considerations apply in box-cutting and similar work, where special equipment to let regular machines continue may be a paying investment.

With output up and increasing pressure for lower costs, many strippers have increased productivity by larger, lighter alloy dippers, in several instances with counterweights, boosting swing or hoist speed and other shovel revisions. Dipper size grows steadily, with the present limit at 35 cu.yd., although some still prefer the greater flexibility provided by two smaller instead of one large machine. Thickening overburden is being met by draglines to help out shovels, with walking units carrying buckets as large as 15 cu.yd. most in demand. Several operators have adopted such equipment for the entire stripping operation. Increases in size of dippers on loading shovels and the use of alloys has accompanied rise in stripper size.

Smoothing the path of the stripper requires, in many pits, shooting the overburden. To reduce the cost and make this operation more efficient, operators have called on new fixed explosives and additional liquid-oxygen facilities. Sidewall drills have been widely adopted, while in the vertical field new higher-capacity well drills supply the extra capacity required, and now are supplemented by vertical augers and rotary rigs.

The advantages of automotive haulage have been reflected in almost universal use. Even where rail equipment still is used, it is common to reserve the pit stage to automotive units. To meet demands for higher capacity and lower costs, size of units has risen to, in some cases, 70 or 80 tons. To handle these larger units, engine size has steadily increased, diesel fuel has staged a major advance, with a number of supercharged diesel engines in service, and butane is employed by a growing number of companies. Road construction and maintenance standards have shown corresponding advances.

CINCINNATI—AND THE JOB THAT'S AHEAD

An Invitation

From the National Chairman

THE coming demand for coal is the thought uppermost in our minds as we look forward to the 18th Annual Coal Convention and Exposition of the American Mining Congress at Cincinnati, April 28–May 2.

Most of us can remember the days of '17–'18 and the vital part our industry played at that time. Arms, ammunition, shipbuilding, transportation of men and supplies within our own borders and overseas all depended upon an adequate supply of American coal.

Today we are confronted with a somewhat similar situation—with one great difference. A generation ago the major problem was one of raising and equipping an army of men. This still exists, but the pressing demand upon us today is for materials and machines.

Thousands of airplanes, tanks, trucks and guns; hundreds of ships and all the other equipment that goes into the formation of modern military and naval units—these call for materials in quantities never before needed. Since their procurement depends on an adequate fuel supply for transportation, manufacture and delivery, our mines form the base upon which this huge defense program rests.

The coal industry—operators and manufacturers—must organize to meet this emergency. But, in doing this job, we must keep in mind what happened to the industry after the last emergency was over and so plan that this will not happen again. The problem we are facing is one of production; the answer will be through efficiency rather than expansion—the coordination of men and machines, fully utilizing what we can of our present equipment and replacing obsolete equipment with modern facilities.

Progress made in recent years in modernization has been the result of intelligent management, coupled with intelligent engineering in the development of new methods and machines. Plus cooperation. Because the men of the industry have been willing to exchange ideas and work together, development of new practices and methods has been accelerated to a degree not otherwise possible.

The American Mining Congress has done a real job for the industry in its leadership of this modernization program. The annual conventions at Cincinnati have led the way in these progressive activities. This year's exposition will show every type of machine and equipment used in coal production; the convention sessions will present papers on all the major phases of mining. A detailed inspection of the exhibits, attendance at the convention sessions, and personal contacts with operators and manufacturers who will be present will give a comprehensive view of modern mining that could be equalled only by an extended trip through the coal fields.

Coal faces a big job. The men who are responsible for the management of our mines, as well as their staffs, should take advantage of this opportunity of seeing the equipment, hearing the papers, participating in the discussions, and coordinating in plans so that we may all work together in the great national-defense effort that lies ahead.

George B. Harrington

National Chairman, Program Committee
American Mining Congress

PROGRAM

18th Annual Convention of Practical Coal-Operating Men and National Mining Equipment Exposition

AMERICAN MINING CONGRESS

Music Hall, Cincinnati, Ohio, April 28-May 2

MONDAY • APRIL 28 • MORNING

Opening Addresses

George B. Harrington, president, Chicago, Wilmington & Franklin Coal Co., and National Chairman, Program Committee.

Arthur S. Knoizen, vice president, Joy Mfg. Co., and Chairman, Manufacturers' Division, American Mining Congress.

R. L. Ireland Jr., president, Hanna Coal Co., and Chairman, Coal Division, American Mining Congress.

Coal and National Defense

L. W. Householder, vice president, Rochester & Pittsburgh Coal Co.

Certain Aspects of Coal Mine Safety

Eugene McAuliffe, president, Union Pacific Coal Co.

MONDAY • APRIL 28 • AFTERNOON

Shuttle-Car Haulage With Mechanical Loading

S. L. Anderson, superintendent, Peabody Coal Co.

Large Transfer Cars, Transfer Station and Track Haulage for Mechanical Loading

David W. Jones, general superintendent, Princeton Mining Co.

Auxiliary Face Operations

A. E. Duckwall, chief engineer, United States Coal & Coke Co.

TUESDAY • APRIL 29 • MORNING

Recommended Practice for Mechanical and Electrical Maintenance

Frank Eubanks, superintendent of maintenance, Old Ben Coal Corporation.

Lubrication for Mining Equipment—Selection, Use and Handling

Harold S. Lowry, chief engineer, Snow Hill Coal Corporation

"Information, We Hope" — Answers to Mining Problems—A Panel of coal operating experts

TUESDAY • APRIL 29 • AFTERNOON

Power Distribution for Mechanical Loaders and Conveyors

R. L. Kingsland, electrical and maintenance engineer, Consolidation Coal Co.

Underground Dragline Conveyor

A. Fred Phelps, superintendent, Pardee & Curtin Lumber Co.

Safety With Mechanical Mining

R. H. Nicholas, chief inspector, Pittsburgh Coal Co.

Coal Stripping Session

Exploration for Coal Stripping

Walter B. Roe, geologist, Truax-Traer Coal Co.

Overburden Preparation — Methods, Practices and Equipment

Carl E. Walker, Ayrshire-Patoka Collieries Corporation

Planning and Working Smaller Strip-Mine Operations

F. R. Phillippi, vice president and treasurer, Dye Coal Co.

WEDNESDAY • APRIL 30 • MORNING

General Economics of Dewatering Fine Coal

C. J. Potter, manager of preparation, Rochester & Pittsburgh Coal Co.

Preparation of Stoker Coal — Economic Factors Involved

Jack H. Price, coal sales manager, Stearns Coal & Lumber Co.

Cleaning Fine Coal Below Stoker Sizes
Virgil Cargile, general superintendent, Tennessee Products Corporation

WEDNESDAY • APRIL 30 • AFTERNOON

Conveyor Mining in Alabama
F. J. Immler, assistant to chief engineer, Alabama By-Products Corporation

Requirements for Successful Duckbill Mechanical Loading
S. W. Blakslee, general manager, Powhatan Mining Co.

Economics of Gathering Belts With Mechanized Mining
Carel Robinson, consulting mining engineer.

Coal Stripping Session

Hydraulic Application to Coal Stripping
R. E. Henderson, general superintendent, Pyramid Coal Corporation

Open-Pit Coal-Mine Haulage
Eric C. Laurell, superintendent, United Electric Coal Cos.

Strip-Mine Maintenance
George E. Nettels, general superintendent, Pittsburg & Midway Coal Mining Co.

THURSDAY • MAY 1 • MORNING

Effect of Mechanization on Managerial and Supervisory Problems
James Hyslop, general manager, Hanna Coal Co.

Vocational Training and Education for Mine Employees
T. J. Thomas, president, Valier Coal Co.

"Information, We Hope"—Answers to Mining Problems
A panel of coal-operating experts

THURSDAY • MAY 1 • AFTERNOON

Federal Regulation
Speaker to be announced

Causes and Prevention of Mine-Roof Deterioration
H. B. McNary, construction engineer, New River Co.

Need and Use of Altimeter Surveys in Mine Ventilation
Stephen Krickovic, general mine inspector, Koppers Coal Co.

FRIDAY • MAY 2 • MORNING

Exhibitors' Day—no convention sessions. Exposition open 9 a.m. to 1 p.m. List of exhibitors (totaling over 135) is given below.

CINCINNATI SHOW EXHIBITORS

Ahlberg Bearing Co.
Air Reduction Sales Co.
Alabama State Exhibit
Allis-Chalmers Mfg. Co.
Allis Co., Louis
American Brattice Cloth Corp.
American Bridge Co.
American Cable Division, Hazard Wire Rope Division
American Car & Foundry Co.
American Chain & Cable Co., Inc.
American Cyanamid & Chemical Corp.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
Atlas Powder Co.

Barber-Greene Co.
Bemis Bro. Bag Co.
Bethlehem Steel Co.
Bixby-Zimmer Engineering Co.
Bowdil Co.
Broderick & Bascom Rope Co.
Brown-Fayro Co.
Bucyrus-Erie Co.

Cardox Corporation
Carnegie-Illinois Steel Corp.
Central Electric Repair Co.
Centrifugal & Mechanical Industries, Inc.
Chicago Pneumatic Tool Co.
Cincinnati Mine Machinery Co.
Cities Service Oil Co.
Coffing Hoist Co.

Deister Concentrator Co.
Deister Machine Co.
Differential Steel Car Co.
Duff-Norton Mfg. Co.
Du Pont de Nemours & Co., Inc., E. I.

Edison, Inc., Thomas A.
Electric Railway Equipment Co.
Electric Railway Improvement Co.
Electric Storage Battery Co.
Enterprise Wheel & Car Corp.

Fairmont Machinery Co.
Flocker & Co., John
Flood City Brass & Electric Co.

General Electric Co.
Gibraltar Equipment & Mfg. Co.
Goodman Mfg. Co.
Gorman-Rupp Co.
Gould Storage Battery Corp.
Gulf Oil Corp.

Haynes Stellite Co.
Hendrick Mfg. Co.
Hercules Powder Co.
Hulburt Oil & Grease Co.

I-T-E Circuit Breaker Co.

Jeffrey Mfg. Co.
Johnson-March Corp.
Joy Mfg. Co.

King Powder Co.
Koppers Co.

La-Del Conveyor & Mfg. Co.
Lee-Norse Co.
Leschen & Sons Rope Co., A.
Linde Air Products Co.
Link-Belt Co.
Lock Stove Co.

McGraw-Hill Publishing Co., Inc.
McLanahan & Stone Corp.
McNally-Pittsburg Mfg. Corp.
Mack International Motor Truck Corp.
Macwhyte Co.
Mancha Storage Battery Locomotive Co.
Marion Steam Shovel Co.
Markham Products Co.
Mechanization, Inc.
Metal & Thermit Corp.
Mine Safety Appliances Co.
Mines Equipment Co.
Mining Congress Journal
Mining Machine Parts, Inc.
Myers-Whaley Co.

Nail City Bronze Co.
National Carbide Corporation
National Carbon Co., Inc., Carbon Sales Div.
National Electric Coil Co.
National Malleable & Steel Castings Co.
National Tube Co.
Nordberg Mfg. Co.

Ohio Brass Co.
Ohio Carbon Co.
Osmose Wood Preserving Co. of America, Inc.
Owens-Corning Fiberglas Corp.

Penn Machine Co.
Pennsylvania Electric Coil Corp.
Philco Corp., Storage Battery Div.
Portable Lamp & Equipment Co.
Post-Glover Electric Co.
Productive Equipment Co.
Prox Co., Inc., Frank
Pure Oil Co.

Reliance Electric & Engineering Co.
Roberts & Schaefer Co.
Robins Conveying Belt Co.
Roebling's Sons Co., John A.
Rome Cable Corp.

Safety First Supply Co.
Sanford Day Iron Works, Inc.
Scully Steel Products Co.
Simplicity Engineering Co.
Socony Vacuum Oil Co., Inc.
Standard Oil Co. (Indiana)
Stephens-Adamson Mfg. Co.
Sullivan Machinery Co.
Sun Oil Co.

Talcott, Inc., W. O. & M. W.
Tamping Bag Co.
Templeton, Kenly & Co.
Tennessee Coal, Iron & Railroad Co.
Tide Water Associated Oil Co.
Timken Roller Bearing Co.
Tool Steel Gear & Pinion Co.
Trabon Engineering Co.
Tyler Co., The W. S.

Union Carbide Co.
Union Wire Rope Corp.
United Engineers & Constructors, Inc.
U. S. Bureau of Mines
U. S. Rubber Co.
U. S. Steel Corporation Subsidiaries

Watt Car & Wheel Co.
Weir Kilby Corp.
Western Cartridge Co.
Westinghouse Elec. & Mfg. Co.
West Virginia Rail Co.
Wheat Lamp Sales, Inc.
Wilson Welder & Metals Co., Inc.
Wood Preserving Corporation

MINING-SCHOOL SURVEY

Shows Coal in Student Doghouse; Extension and Special Courses Are Popular

Modern coal mining needs more technically trained men—both graduate engineers and men developed from the rank-and-file of the industry's workers. Few undergraduates in the mining schools, however, are thinking in terms of coal as a career. And the number of graduate engineers who have entered the industry in recent years is shockingly small. This article tells why from the student's side. The picture contrasts sharply with that on extension courses for ambitious men already working in the industry.

COORDINATION of man-power and machines—so essential to successful modern coal operations—puts a premium on trained personnel. Theoretically at least, the raw material for such personnel can be drawn from three sources. These are: (1) mining-school graduates; (2) ambitious workers from the ranks, trained by and within the coal industry itself with or without the assistance of the mining schools, and (3) qualified men from other industries, including metal mining. Obviously, however, most of this personnel must come from the first two groups.

Because the demand for such personnel is increasing very rapidly these days, the question of supply is a major one. This is particularly true with respect to the first group. Past indifference on the part of most coal-mining companies outside the anthracite region to technically trained men has bred a corresponding indifference on the part of the average engineering student to coal mining as a career. Depression in the anthracite industry in recent years has narrowed the opportunities for employment in hard-coal mines and has diminished student interest in mining schools in that area.

The seriousness of the situation was highlighted in 1938 in the report of the committee for the promotion of student interest in coal mining set up by the Coal Division of A.I.M.E. and headed by Newell G. Alford. It had been the hope of the committee, stated the report, to be able to "make a set of comprehensive recommendations for relieving the industry immediately from the growing dearth of youth who yearn for coal-mining careers." But it found the situation much more critical than at first diagnosed. What was needed, concluded the committee, was the industry's permission "for still another major operation on its frame of mind."

Present conditions show little improvement over those set forth in the Alford report three years ago. These summary conclusions are based on a special survey made by *Coal Age* for this issue. This survey covered enrollments, job placement, curriculums, student attitudes and related subjects at 19 schools in coal-producing States. The survey in those States was limited to institutions whose mining curriculums have been approved by the Engineers' Council for Professional Development. During the last five years, these 19 schools have had an average annual enrollment of 1,325 students. The total number reported entering coal mining during the same period was slightly more than 120—or 9.2 per cent of the average annual enrollment.

Analysis of the data submitted in response to the *Coal Age* questionnaire reveals sharp sectional differences. For the purposes of sectional study the 19 schools were placed in three groups: Appalachian; Midwest, Southwest and Plains States; and Rocky Mountain and Pacific States. The Appalachian group embraced eight schools; the Midwest-Southwest-Plains States, five; the Rocky Mountain-Pacific group, six schools. Sixteen of the 19 schools are State institutions; the three private schools are in the Appalachian group.

The schools covered by the survey are: University of Alabama, Colorado School of Mines, University of Illinois, University of Kansas, University of Kentucky, Lafayette College, Lehigh University, Missouri School of Mines and Metallurgy, Montana School of Mines, New Mexico School of Mines, University of North Dakota, Ohio State University, Pennsylvania State College, University of Pittsburgh, South Dakota School of Mines, University of Utah, University of Washington, State College of Washington, and West Virginia University.

Rocky Mountain-Pacific schools report the largest total enrollment; the eight Appalachian schools come second. Higher enrollment in the Far West is a direct reflection of the encouragement which has been given graduates by the metal-mining industry. Indifference to coal mining as a career is most marked in this same area. Current student interest in coal is low in the Midwestern institutions and still lower in the Plains States. Interest is highest in the Appalachian group of mining schools. These varying degrees of interest, as will be pointed out later, are intimately tied in with job placements in the coal industry.

Six of the eight Appalachian schools report that the demand from the coal-mining industry is greater than their

available supply of graduate mining engineers. The seventh states that there is no intense demand but that jobs, nevertheless, are available for all graduates. One of the two Southwestern schools included in the Midwestern-Plains States group says no coal-mining jobs are available; the other reports jobs open but difficulty in persuading men to accept such positions. Few graduates from the Far Western schools have entered coal mining in the last five years.

Summer employment of undergraduates has come to be recognized in many industries as an excellent way in which to spot out likely candidates for permanent jobs in the future. Few coal-mining companies, however, appear to have adopted this as a regular practice. The Appalachian group reports 31 companies offer summer jobs to undergraduates; the Midwestern-Plains States group, three companies. These figures include duplications, as one progressive mining company will seek undergraduates from several schools. In the case of the Rocky Mountain group, for example, two schools reported the name of the same company—incidentally a large producing company in the Appalachian region.

Job Offers Are Few

Heads of mining schools and departments generally are agreed that the coal industry tails the procession in offering jobs to students about to graduate. Just when such offers should be made, however, is a question upon which there is no unanimity of opinion. While Feb. 1 of the senior year is named as the deadline by many, some would advance this to December and a few would postpone it to March 15 or April 1. The question of timing, as one professor points out, is not as simple as it seems because it may raise psychological complications.

"From one standpoint," he says, "early offers and a large number of interviewers on the campus tend to implant a feeling of importance in the student's mind and this does not work toward a struggle on his part. On the other hand, a small number of inquiries and a required effort on his part to find a job leads to a much better attitude and probably means that the lad has less to unlearn when he gets into the field.

"Again, the early offer leads to a feeling of security and to some extent sets up a definite goal toward which the student can work. Whether this is good or not is also a question in that, if he isn't of just the right type, he may be inclined to neglect those things which do not have a direct bearing."

The majority of the 19 schools offer no special course in coal mining. Some include certain coal-mining courses as options in the curriculum. A few offer specialized courses in coal after the freshman year. Most of the schools take the position that the engineering fundamentals taught are common to all branches of mining. Some that did have optional courses have abandoned them because of lack of student interest in such electives. Advocates of study limited to common foundamentals inferentially at least express the

view that graduates so taught are fitted to step into any branch of mining.

Less than one-third of these schools report "any outstanding changes in curriculums" or introduction of new courses during recent years. One Far Western institution made changes to meet the standards of the Engineers' Council for Professional Development; another increased the time given to mechanical operations and mine ventilation. A separate course on mine ventilation was established in a Southwestern school. Changes in the Appalachian group include greater emphasis on the mechanical and electrical phases of mining and increased attention to management and the broader economic problems of industry. One school has shortened some of its old stereotyped courses to make room for courses on time study and production engineering.

With the exception of the Ohio Institute of Mine Management (see p. 73), none of the 19 accredited institutions has introduced resident courses not leading to a degree in mining engineering. One other Appalachian school is planning a six-weeks' short course this summer. The idea of such courses also has been discussed at one of the Pacific Slope schools. Where such courses are offered, they generally are non-resident and are conducted as part of extension-school or vocational-training work. One institution not included in the 19 covered by the survey does have a resident course in maintenance.

A score of explanations why a coal-mining career does not appeal to the average student is given in the returns to the *Coal Age* questionnaire. Most of them, however, are variations on two basic themes: (1) Starting salaries are too low and (2) opportunities for advancement are limited. Comparisons with starting salaries are generally made with those prevailing in metal mining. One case is cited where a coal company offered a graduate engineer a starting salary of $60 per month; the fledgling engineer considered this an insult. Complaint also is made that the young engineer must work three years "before he can rise above the ordinary individual."

No Future, Many Think

Many students believe that the industry has no future. This belief is largely influenced by competition and the two-well publicized story of the economic and financial plight of the coal mines. Labor agitation, overproduction and slack running time also contribute to this unfavorable opinion. The manner in which accidents have been featured in the daily press is another drawback. Bad natural mining conditions and communities where living conditions are unattractive likewise help to create an unfavorable impression.

Too frequently, it is reported, coal-company officials themselves discourage young men in their communities from studying engineering with the coal industry as their objective. Mine workers, too, seek to keep their sons from following in their footsteps. An interesting sidelight on this situation is revealed in the census of parents' occupations for the first 1940-41 semester at Penn State. Sons of miners are ninth in the list of 25 occupations, but only 9 per cent of this group are enrolled in the mining school. In the agricultural school, 68 per cent of the enrollees are farmers' sons.

That most coal-mining companies have no adequate training program

for the graduate engineer is still another complaint. These companies, declares the head of one mining-school department, do not know what engineering is or how to use an engineer after he has been hired. The day when an engineer was buried in the surveying corps, however, is past, retorts the head of another school. But the feeling that the engineer is only an inescapable nuisance whose employment is made necessary by State mining laws requiring that mine maps be kept up to date is still prevalent.

West Virginia Institute of Technology, formerly known as New River State College, has been conducting resident courses in maintenance work since 1934. Interest in this instruction, however, was not marked until about 1938, when the surplus of maintenance workers began to diminish. Even today enrollment is not high. About 75 per cent of the students come from coal-mining communities. Enrollees with a high-school education are preferred but no barriers are set up against ambitious applicants not so qualified. Placement of students who have completed the course approximates 100 per cent.

Shop Courses Given

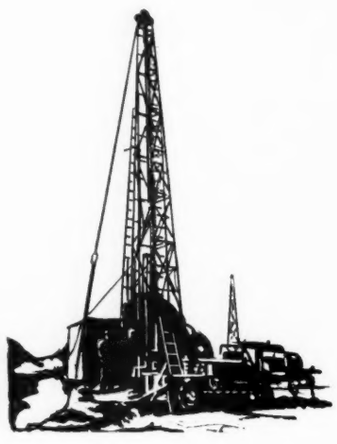
At present, the courses are set up on a twelve-weeks' basis. Exceptions are made in some courses where shift work interferes with the class operation. Courses are given in the shops and laboratories on the school campus at Montgomery. The courses cover: theory of mechanics, practical applications of electricity, study of mining machinery and its operating characteristics, safe practices in moving equipment, and wiring diagrams. Machine-shop practice, electrical and acetylene welding, motor repairs, industrial wiring and control are taught in the shop courses.

Only three of the 19 accredited schools canvassed conduct extension or vocational-training courses. These three are Ohio State, Penn State and West Virginia University. Kentucky offers a non-credit correspondence course in the fundamentals of coal mining. Shortly after this course was started about ten years ago, an eight-weeks' resident course covering much the same ground was discontinued. University of Illinois is now working with the Illinois Mining Institute on plans to establish field extension courses to prepare men for supervisory positions.

Credit for the pioneer work in this field goes to Penn State, which began extension work in 1893, but dropped it in 1899 for financial reasons. Courses were revived in 1919 with funds made available under the Smith-Hughes vocational-education law. Further expansion occurred in 1923 and again in 1931. Enrollment since 1931—the first year accurate records were kept—to 1941 totaled 16,863. The enrollment by years since 1935 has been as follows: 1935-36, 2,098 students; 1936-37, 1,204; 1937-38, 1,462; 1938-39, 1,502; 1939-40, 1,941, and 1940-41, 2,288 students.

West Virginia started a six-weeks' short course in 1913 and night extension classes in 1915. Total enrollment in the former has been 2,055; in the night extension classes, 34,834. Short-course enrollment in recent years has been: 1935-36, 172; 1936-37, 240; 1937-38, 167; 1938-39, 127; 1939-40, 136. Night-extension enrollment figures have been: 1935-36, 1,657; 1936-37, 1,658; 1937-38, 1,873; 1938-39, 1,787; 1939-40, 1,813; 1940-41, 2,097. Ohio State began to operate under the Smith-Hughes act in 1928. Total enrollment since that time has approximated 3,000; average enrollment per year has been about 250 at the start of the courses, but about 50 students drop out before the end of the year.

Penn State extension courses are conducted in 70 mining centers; West Virginia at 51, and Ohio State at 10. Two full-time and 70 part-time instructors are employed by Penn State; Ohio has two full-time teachers; West Virginia employs nine full-time and five part-time instructors. In each case, the extension course is a three-year one. The Ohio plan calls for two 2-hour lessons 40 weeks per year; Penn State sets up 144 hours of classroom instruction and coordination each year; West Virginia night classes approximate 36 sessions of two hours each in a year. The West Virginia short course is more concentrated and calls for 264 hours in six weeks.



Subjects taught include: mine gases, ventilation, roof support, transportation, pumping and drainage, mining systems, elementary mining electricity, coal-formation geology, safety, mining arithmetic, and State mining law. Elementary general science is part of the Ohio State curriculum. The first year of the Penn State extension course is designed to enable the student to pass State examinations for fireboss and assistant mine foreman; the second year, for mine foreman, and the last year, for State mine inspector.

Revisions Every Two Years

Lesson material is revised every two years at Penn State "to keep abreast of the times." The most recent major change has been toward increased instruction in mine mechanization. Special training in maintenance work for advanced extension-course students was started two years ago. There are now nine classes with a total enrollment of 500 men, most of whom have completed the regular three-year extension course. Three 10-week courses are offered: the first covers the fundamentals of mechanics and electricity; the second covers the construction, application and safe operation of all types of mechanical equipment used in the mine concerned, and the third course, maintenance and repairs in service.

Major changes also have been made in the subject matter of the West Virginia extension courses "to more closely adapt the work to the training needs of the industry as occasioned by the increased mechanization of mining procedures. These changes involve more stress on such subjects as foremanship, mathematics, mechanical-mining practice and the maintenance of mining equipment." The only noteworthy change in the Ohio State course is a revision of the text on drainage.

Complete cooperation by the mining companies in encouraging attendance and in making better jobs available to students who complete the course is reported by one school. The second characterizes industry cooperation as "good." Many companies, it adds, make it a general rule "to make promotions to minor executive positions from the class groups." The third school reports cooperation excellent from a very few mining companies in the State, with the rest apathetic.

HOW MINING SCHOOLS

And Industry Can Cooperate To Stir Student Interest in Coal Careers

Too few engineering students, as the survey on page 68 shows, are interested in coal mining as a career. This is a problem for the mining schools, but a still more critical one for the industry. If the situation is to be changed, coal-mine officials must actively encourage likely young men in their own communities to take up mining engineering.

By D. L. McELROY
Director, School of Mines
West Virginia University

FUNDAMENTALLY, the mining school has two jobs to perform: (1) training young men for technical and executive positions in the industry, and (2) research on coal-mining problems. This is true in normal times; more so during this period of national defense and will be still more so during the highly competitive post-war period to follow. The first-mentioned assignment—training men—is of the longest standing and the most important. This training need not be confined to the resident student body. Mining schools can, and some do, accomplish much by lending cooperation or fully carrying on field programs for graduates and other employees on a vocational basis. Research work also is highly important and, if well done, can be of much help to the industry.

When training men in mining engineering the school has an obligation first to the student and second to the industry. Both students and industry expect the graduates to be fundamentally trained to fit into modern coal mining. What curriculum fits this pattern is naturally a matter of opinion, but suggestions of experienced graduates and employers make a good guide. Such training implies a thorough grounding in mathematics, chemistry, physics, surveying, mechanics, geology and electricity. Increase in mine mechanization has made electricity much more important than it formerly was. Courses in English, public speaking and economics also can be considered essential.

A student planning to enter the coal industry certainly should be well acquainted with the principles of the development and operation of a coal mine. The basic subjects, taught mainly from the engineering and economic standpoints, should include mining methods, haulage, hoisting, drainage, ventilation, utilization of mining machinery, and coal preparation. Some work in labor problems, accident prevention, and compensation also are essential today. The increased importance of engineering in coal distribution has made courses in coal utilization popular. Several schools take care of this problem with fuel options or by placing such courses in the regular curriculum.

With increased mechanization operations are getting closer to "factory" methods. Mining schools must organize accordingly, since this change means more and better supervision and management. Close organization and coordination of every job from the face to the tipple is essential. Coal mining today is an industry of machines and men, with men naturally the main factor. Only through intelligent planning and organization of the use of the machines in conjunction with skillful handling will this form of mining reach its peak of safety and efficiency. The men graduated from mining schools will form the cornerstone of this new order of mining. Therefore, the future of the industry depends considerably on how good a job the mining schools do.

It is the writer's belief, based on experience, that students from mining localities are the most successful after graduation. Such students have a background that is of great value to them, not only when on the job but also while in school. With about 100,000 families living in the coal towns of the country, there should be plenty of healthy, intelligent and ambitious young men from these families to fill the hollow ranks of technical trained mining men. The facts are, however, that mining-school enrollments are far too low to furnish the number of graduates wanted by the coal industry. The whole industry is familiar with the effects of bad publicity received by it, particularly regarding explosions and other hazards. Such publicity has done much to keep young men out of mining schools, and it is the job of both the schools and the industry to counteract this publicity with the presentation of the good points—and there are plenty of them.

Another important factor in keeping many boys, from mining regions, out of mining schools is the attitude of many coal-mining officials. Several officials are known who lament the shortage of mining graduates yet discourage young men in their communities from taking mining engineering. Very few mining officials actively encourage young men from their towns to take mining. Even some of those who have won high places in the coal industry, perhaps higher than they would have achieved in other fields of endeavor, are found to be the industry's worst "knockers" to young men.

D. L. McElroy

Since the majority of the young men raised in mining towns will enter the mines, why not encourage the best of them to prepare for jobs which now go begging for proper personnel? Some of these boys will need financial assistance which could be given by summer jobs, or loans if necessary. Some few companies—too few—are offering scholarships to outstanding high school graduates on their properties. Such a policy tends to supply needed technical graduates and certainly it is appreciated by the student, his family and friends.

The coal industry in the last few years has generally recognized the importance of graduate mining engineers by furnishing summer jobs and by offering good permanent jobs to graduates at salaries considerably more than was true several years ago. It cannot be said now, as was often the case in the past, that the graduates are buried away in a surveying corps. A number of companies (also too few) have established carefully organized training programs for these men and responsible positions usually are open when the men are prepared. Several cases can be cited where men have received superintendent jobs within four to six years after graduation—and made good at them.

The improved cooperation of the industry is shown by the fact that there probably will not be a college coal-mining student in the country this year who wants work who will not have it. This phase of cooperation is important in that it gives the companies a chance to look over young men before graduation, and the student a chance to get needed experience as well as an acquaintance with the company. Such a combination usually leads to permanent employment after graduation.

Graduates employed after such summer work generally get along faster than those not having such a background. Another important feature of summer employment is the aid this experience gives the student in his school work, not to mention the financial help. Incidentally, this experience of the student does much to make faculty members keep up to date on modern mining practices. Summer jobs are sufficient to care for not only juniors but also sophomores and freshmen.

A mining school, with its staff, laboratory facilities, enrollment of graduate students and close contacts with industry, is an ideal place in which to do research work. Graduate fellowships, with graduate students working under faculty supervision, make an economical and efficient method of attacking research problems. In addition to results achieved by such studies under this system, the graduate students who did the work are specially trained on the problems and are available for employment in the industry.

Machines Pose Problems

Increased mechanization has brought many operating and safety problems which need study. The mining school should do the research work on these problems. Several schools have been doing research work on roof control, subsidence, mechanical mining methods, preparation, combustion and other subjects. Closer cooperation of mining schools and the coal industry in research work is one definite way of improving operating and marketing conditions. The future should, and no doubt will, see an increased number of graduate research fellowships established at mining schools by coal companies. Research, particularly industry sponsored, has been sadly neglected. This type of investigation must increase and the mining schools will have an important part in it.

If at all possible, every mining school should engage in some type of extension activity. There are several good reasons for such a policy. Such a program makes the facilities of the school available to far more persons in the coal industry, thus extending its services. Another reason is that, although extension work may be organized under some other agency, the mining school can cooperate, and certainly such technical cooperation will help such a program. Extension activities also give a school much needed contacts with the men at the mines and bring the school and industry closer together. Staff members of mining schools sometimes find it difficult to keep up with modern mining practices by actual contact. A school which engages in extension work finds such contacts easy to maintain and, what is more important, mining courses will be up to date for the college student.

Basically, mining problems today are a good bit the same as in the past. The increase in mechanization, however, has intensified many of these problems, such as haulage, ventilation and maintenance. This change and the accompanying problems of preparation have definitely brought out the importance of technically trained men in the industry. It is rapidly changing from an industry of "straw" bosses and common labor to one of trained managers and skilled labor. The place and obligations of the mining school in this new way of things is self-evident.

The coal industry has the obligation of helping to get students into mining schools. Mining graduates are scarce for the simple reason that enrollments are low, even if increasing during the past few years. Coal companies can do more to help this situation than any other group—even the mining educators.

Defense Heightens Needs

In connection with the national defense program coal production will rise and along with it an even greater need for technical men. At the same time the number of men available probably will be less, due to smaller enrollments, military service and keener competition for men. Many of the mining graduates in 1941 will receive commissions in the army and be called for duty. Also, due to military service and the increase in employment, a number of undergraduates already have withdrawn from college.

During the post-war period there will certainly be very keen competition for the fuel markets. Coal's success in these markets will depend to a large degree on the ability of its personnel. Therefore, now is the time for the mining schools and the industry to build up the personnel to meet this coming competitive period as well as the present emergency.

SHORT SUMMER COURSES

Give Supervisory Mine Officials Better Understanding of Industry Problems

"We teach everything but mining" might well be the slogan of the Ohio Institute of Mine Management. Maybe that's why its work has been so highly commended by both students and their employers. Courses such as these give the mine foreman a broader picture of his particular job in its relation to his company and the industry as a whole. They answer, in part at least, the rising cry that training in the technical aspects of mining alone is no longer enough.

By H. E. NOLD

Professor of Mining Engineering
Ohio State University
Columbus, Ohio

INCREASED mechanization has created a demand for more section foremen. The foreman in charge of a mechanized unit has a more difficult job than his predecessor in a hand-loading section. He must be able to plan so that each man's work will be done on time and the loading equipment will be kept busy. His work is more technical and requires more analytical ability than was expected from the old-type foreman.

Section foremen in our modern mines to a larger extent are young men, recruited either from the ranks of labor in the mine or from the technical force. All too frequently, however, these young foremen lose sight of the broader aspects of their jobs, in caring for the multitudinous details for which they are responsible. They have a tendency to think of their section as a completely isolated unit and lose sight of the fact that they are integral and essential parts of a large organization which in turn is part of a still larger industry. Too frequently these men also fail to realize that coal mining is not just a problem of mining and shipping coal but fundamentally one of producing a marketable commodity sold on a keenly competitive basis.

In 1938, the manager of an Ohio company called upon the writer and explained that rapid expansion of mechanical loading had caused an acute shortage of suitably trained section and mine foremen. Search for mining school graduates with enough experience to take these positions again demonstrated what educators had recognized for some time: the industry had not squarely faced the problem of providing for its future personnel needs and very few competent technically trained foremen were available.

The problem of taking young men from the mines and giving them some type of intensive training for foremanship was next discussed. After a number of conferences with eastern Ohio companies, it was decided to offer a four weeks' summer training course at Ohio State University in 1939. This course was called the Ohio Institute of Mine Management. Its objectives were defined as follows:

> To give those engaged in mining and others vitally interested in the coal industry a broader understanding of the industry with which they are associated, its practical problems, and its important relationship to other phases of American life and business.

Serious consideration was given to the relative desirability of holding the institute in the mining field or on the university campus. It was finally agreed that it would have a better chance of success at the university because holding it there would bring the men into a new environment where they could devote full time to the work without any interference by the responsibilities of their employment or their home life. It was further believed that the atmosphere of the university, combined with the library facilities and the availability of a greater number of expert teachers, would all react to intensify the interest of the students and enhance the value of the institute.

With the objectives stated, courses on mining techniques obviously had little or no place in the program. The men who would attend such an institute already were familiar with the subject and most of them would lack the prerequisites of a study of mining technology. As outlined in the announcement, the course for the 1939 institute covered lectures, discussions and demonstrations on the following subjects:

Place of mineral raw materials in modern civilization
- Mineral resources in the United States.
- Mineral resources in Ohio.
- Place of coal in industry today.

Development of our society from individual self-sufficiency to an industrial nation
- Change from rural to urban nation.
- Place of capital, management and labor in our present system.

Current economic problems and their possible solutions
- Overproduction, underconsumption and disposal of surpluses.
- Mechanization of industry and its effect upon production, labor, etc.
- Nature of consumer demands.

H. E. Nold

Nature of modern corporation—organization, management and financing.
Methods of accounting and determining financial returns.
Laws as they relate to industry.
Selling and distribution of coal.
Industrial psychology.
Fatigue, working speeds, etc.
Selection, organization and management of men.
Labor relations—labor contracts, grievance adjustments and functions of unions.

The institute was organized into three 1½-hour periods per day, with frequently a 30- to 45-minute discussion period terminating the day's work. Instructors were carefully selected from the university faculty and from well qualified men in industry. Each instructor usually lectured for about an hour, allowing 30 minutes for discussion and questions. In some cases, instructors invited questions during the lecture so that it developed into a period of lecture and discussion intermixed.

Since in most cases the lectures covered subjects entirely new to at least 75 per cent of the enrollees and because there had to be a meeting of minds between instructors and students to maintain interest and accomplish the desired ends, special care was taken to make sure each instructor knew the background and previous educational training of his audience and that the talks of the various instructors merged to form a completed pattern.

Students thus had opened to them pertinent information in fields that had been a closed book. Frequently the instructor made statements with which some of the men disagreed. The lively, but friendly, discussions which followed such statements generally were stimulating. From the first day, interest was keen and the men took their work seriously. During the noon hour it was a common sight to see a group sitting in the shade of a tree seriously discussing the subjects presented in the classroom. Attendance at the first institute was 31; last year it was 26.

Most of the men were under thirty with the upper age limit about fifty. Attendance at the two institutes included mine and section foremen, outside foremen, surveyors, recent college graduates in training, motormen, a U.M.W. representative, an office man and several mine workers who were looked upon as future section foremen caliber. In almost all cases those attending were encouraged to do so by their employers. In some cases the men requested the privilege of attending. Practically all the men were financially assisted to some extent by their employers. Attendance was very regular.

The 1940 institute followed the same general plan as the first. It included slightly more technical material, such as combustion, coal beneficiation, selection and care of electric motors, properties and selection of metals for various duties, etc. In the main, however, the policy of presenting subjects of economic and sociological content was continued. No underground mining problems were discussed.

Broader View Gained

Evaluation of such a program is difficult. The results are not so much an increased knowledge which can be applied directly to the solution of a mining problem as a changed viewpoint, a better understanding of coal mining as a business and industry, and a broader concept of the responsibilities and duties of foremanship. Perhaps those attending developed a greater tolerance and respect for the other fellow's viewpoint.

If expressions of appreciation by those attending indicate success, then both institutes were successful. The lasting effects perhaps can be best observed by the employers. The university has received several favorable comments from this group. The following, from the manager of one of the larger mines, indicates such schooling does bear fruit:

> I do not know whether or not you have ever received any information regarding the mining careers of any of the students who attend your summer school course. I might state, for your information, that Mr. ....., who was the first boy sent from here and who had assistant mine foreman's papers when he attended summer school, has developed into one of the finest type of inside mining executives whom I know. Before he went to summer school he had his mine foreman's papers, but he was rather carefree and did not take much interest in anything other than getting away from the mine as quickly as possible when his work was done. Now he is practically in charge of the second shift of a triple-shifted mechanical coal mine, and I do not know of any young man who is making as many strides forward as this boy.
>
> In regards to the three who attended the summer course in July, 1940, from our plant, each and every one of them show a great improvement in their application to the work which they are doing. The main thing that appeals to me is the "entire about-face" method of talking that these four boys acquired from the summer course which they took under your instruction.
>
> I just want you to feel that I think your method of doing this summer work is paying all employers who send men down there large dividends, and the only thing that I wish you to do is to continue on with this type of work, as I feel that 90 per cent of the men who attend these lectures are going along in life with a much better chance of success than those who have not received the same privilege.

Company Training Needed

Institutions of this type perhaps should be considered as more or less a makeshift in the training of mine foremen until mining companies can develop a more systematic and comprehensive training course of their own. It is possible, and even probable, that institute work of somewhat modified form should be a part of such expanded training programs.

Increased mechanization is making the work of the section mine foreman more and more technical. It seems probable that within a few years most section foremen will be recruited from graduate mining engineers and that they will be given a rather rigorous, well-planned, systematic training in industry of perhaps two or more years following their graduation from college. Metal mines have for years recruited more men from the ranks of mining engineers than has been true of coal mines. This trend also is strong in other industries. That promotion to places of responsibility will ever be confined to college men seems unlikely, but the difficulty in promotion for the non-college man promises to become greater and greater.

JOB-TRAINING SURVEY

Reveals Few Producing Companies Have Comprehensive Plans to Develop Men

Educators and industry generally agree that training on the job is fundamental—even in the case of the graduate engineer. Since the need for the right kind of personnel is so urgent, it might reasonably be assumed that almost every important producer now has a comprehensive program for turning raw and semi-trained recruits into finished personnel. The survey here summarized, however, does not support that assumption. While some companies have well-rounded programs, many still use hit-and-miss methods.

WITHOUT a trained operator the most modern piece of mining machinery is only a complicated and costly assembly of steel and wire, incapable of efficient output. Without an organization of trained men, closely supervised and coordinated, the most modern installation of equipment purchasable cannot be expected to lower tonnage costs. Manpower is still the most important link in all production lines, and as machine-power usage in the coal industry is increased this importance will be enhanced.

Just what the coal industry is doing in the selection and training of present workers, from whose ranks the face bosses, foremen, superintendents and general managers of the future will be chosen, is now in the center of the spotlight. Just how the industry is trying to meet this problem of preparedness in the national emergency and for the future constitutes a controversial question whenever educators and coal executives meet.

Constructing a yardstick with which to measure the coal industry's present program of employing and training men, nine simple questions were asked a selected executive group of coal operators. Generally divided and roughly classified to give a running account of coal company procedure, *Coal Age* presents these timely returns with the hope that findings will stimulate further discussion of the matter.

The first two questions asked were: "When do you seek men for staffing your properties — near graduation time? How long prior to graduation?" Answers ranged from the laconic "when needed," "only as needed," "anytime needed," to detailed descriptions of coal company-supported scholarships, under which is provided not only cash for tuition but also work opportunity during vacation time, with the idea of carefully developing supervisory personnel of the future.

A number of companies report the employment of junior class college men to work through their summer vacations who, if satisfactory, are then offered permanent positions upon graduation. Others report recent policies of offering jobs to mining students two to three years before graduation, upon recommendation of college faculties. Several companies are selecting young men from their own engineering divisions and are giving them at least one year of intensive training for possible development into future operating officials.

Returns from these first two questions, however, definitely show that only a small percentage of coal companies have launched a comprehensive program for seeking and selecting college men for future operation staffing.

The third question: "What methods do you use to ascertain the suitability and desirability of students for such employment," gave answers ranging from "promotion from the ranks," through various methods of obtaining an individual's qualifications by written application forms and personal interviews, to complete checks on aptitude with the various college faculty members. A number of companies report their primary interest in grade standings, plus the opinion of college deans, regarding their students' ability.

Others consider only men who have had actual mining experience, rather than basing their selection on indicated technical ability in school as a partial guide in selecting personnel. A few companies state that the "hiring of all men is entirely in the hands of the superintendent," while others employ no students in technical positions at any time. Another small group of coal companies rate their selections of future operating personnel upon the applicant's desire and ability to work in the mines.

The fourth question was: "What proportion of men in the several grades of your organization, from and including foremen, are college-trained?" Answers ranged from the zero of "none," in 40 per cent of the returns, through a group reporting from 1 to 10 per cent college-trained men totaling 32 per cent, from 10 to 30 per cent employed totaling 13 per cent, with top grouping above 30 per cent equaling 15 per cent of all returns. A high of 60 per cent college-trained employees was turned in by one company.

An interesting detail from a large anthracite producer gives the per-

When industry calls

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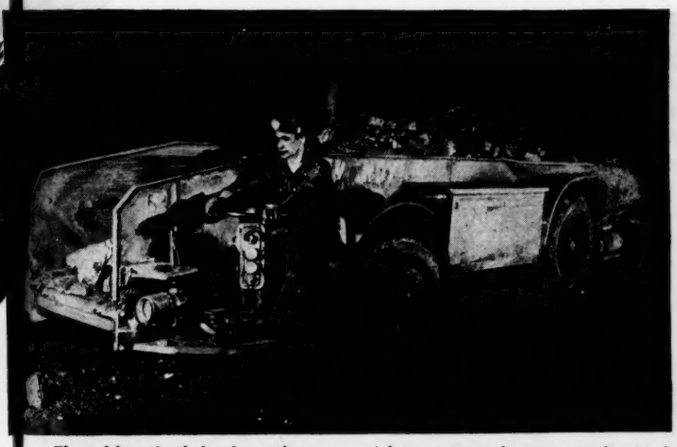
Exide-Ironclad Batteries help the mines deliver on schedule

THERE is scarcely an industry in America that did not use more coal last year than the year before. In round figures, the railroads used 6% more, the utilities 15%, pig-iron manufacturers 34%, and various other basic industries, including steel mills, 17% more. Yet, National Defense, newly organized, had not even hit its stride. Can there be any doubt that coal consumption will substantially increase during the present year?



The rubber-tired shuttle car has won quick acceptance in many mechanized operations. You will get the utmost from a shuttle car when it is equipped with an Exide-Ironclad Battery.

Storage battery propelled locomotives are known to be the safest that can be used. When powered with Exide-Ironclads, they are unsurpassed in dependability as well.

By providing mine locomotives and rubber-tired shuttle cars with dependable power, Exide-Ironclad Batteries played an important part in helping the mining industry step up its 1940 coal production. Still more so can these batteries help supply the need for greater haulage capacity and higher speed to meet the nation's mounting coal requirements in coming months.

The outstanding feature of Exide-Ironclads is their dependability—a quality that becomes many times more essential when the "pressure" is on to produce more tonnage per day in time of national emergency. A haulage interruption can create the kind of bottleneck that upsets the most careful planning.

This is what you avoid with Exide-Ironclads, as most leading mine operators know. But faithful dependability is not the only reason why more Exide-Ironclads are used underground than all other batteries combined. For Exide-Ironclads also offer—high power ability for unusual loads and grades, sustained voltage for consistently good haulage speed, and a service life so lengthy that it far exceeds their guarantee in many instances.

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centage of college-trained men as zero for foremen, 10 per cent for assistant foremen, 55 per cent for superintendents, and 60 per cent for executives. A bituminous coal executive, who is a college graduate himself, reports that they are employing more college-trained men than ever before, and cites that in 1940 eighteen men started work in their organization after completing college courses, and in 1941 they hope to have 28 to 30 more such men employed. Two large bituminous companies, headed by college graduates, say graduates are employed only in the engineering division; none in operations.

To the question: "What are their average entering salaries," one operator said "depends on circumstances," another "wages were pretty well stabilized," while several stated that graduates were paid an hourly rate at working face. Still another cited the fact that "day wage union scale was paid them." Salaries paid graduates starting work ranged from the low of $60–$70, to a high of $200–$250 per month. The average for 59 per cent of total returns was within the $125–$150 bracket.

Majority Train Foremen

To the question: "Do you carry on a specific training program for foremen and other supervisory personnel," 53 per cent answered in the affirmative and 40 per cent in the negative. The remaining 7 per cent qualified by saying that such training "was only by daily contact with the superintendent, plus consistent instruction," "at irregular intervals," and "only as superintendent and underground men find it necessary." One operator said "foreman training was not being carried on at present as it had been done in the past, because they had found that bringing in the same men year after year causes interest to lag through repetition of the subject matter."

Following up the previous question regarding training programs for foremen and other supervisory personnel, operators were asked: "If practiced, what is its nature and extent?" Practically the entire 53 per cent answering the first question in the affirmative cited first-aid and mine-rescue training, general safety meetings, university extension classes and night school courses extending over periods of several years. One far western operator in this group cited vocational training by P.W.A., conducted under the supervision of county schools, which covered all phases of coal mining. An operator in the eastern field points out courses in "foremanship, mechanization, electricity, waste, management, company policies and safety."

As the national-defense program increases the demand for coal, says D. L. McElroy, head of the West Virginia School of Mines, the industry will have an even greater need for technical men. But smaller school enrollments, military service and keener competition for men will reduce the available supply. And this inevitably means training on the job will have to carry a heavier load. What is the industry going to do about it?

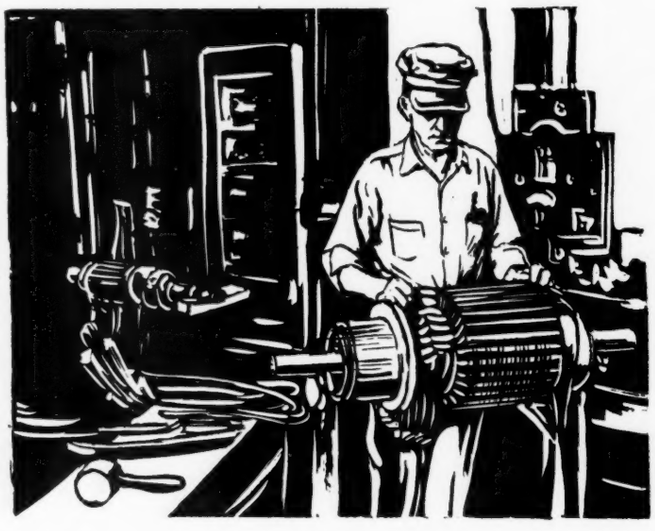
The executive operating head of a number of producing companies in the Appalachian region casually mentioned that foremen and some of the miners in his various organizations also were given the facts and figures of county and State taxation rates and amounts in order to present a further insight into overhead and various and sundry charges making up total individual mine costs. "The miners' knowledge of widely varying tax charges in our several operating fields gives them specific reasons why one property produces while another has more idle time," he added.

In order to obtain information as to the specific training programs carried on for mine workers, the questionnaire returned 47 per cent of total in the affirmative, 43 per cent answered negatively, and 10 per cent were qualified as "nothing specific," "intermittent," or that "new men are teamed with older experienced miners." Of the 47 per cent answering affirmatively, first-aid, mine-rescue training and safety meetings were given as the nature and extent of mine workers' training.

Some returns detailed the fact that mines were divided into small sections, each supervised by a section foreman who instructs his men in safe practices. Others stated "that foremen took an active part in all miners' instruction," while some cited the practice of "instruction in proper blasting, timbering, preparation of coal at the face, and other such work phases."

One captive-tonnage operation answered that "safety, mechanization practices, mining extension school courses and company policies were included in its specific training program for mine workers." Several operators mentioned "national defense training, welding, machine-shop practice and electrical maintenance courses," in promoting the training of maintenance workers.

Questionnaires represent geographical distribution of returns from the States of Pennsylvania, West Virginia, Virginia, Alabama, Kentucky, Indiana, Illinois, Colorado, Wyoming, Utah, New Mexico and Washington. Size of companies ranged upward from the minimum of 100,000 tons annual production. Both anthracite and bituminous operators were queried, as well as both commercial and captive mines.



JOB-TRAINING PROGRAM

Inaugurated by Hudson Coal Co.

Now Covers Both Supervisors and Workers

Experience with planned job training stretches back more than a quarter of a century at Hudson Coal. Originally limited to training supervisors, this anthracite company's program today also covers the workers as well. Not the least interesting phase is the manner in which Hudson is opening jobs to college students with the frank recognition that the new recruits have the same rights to satisfaction and freedom of action as the employer.

By CADWALLADER EVANS JR.
Vice-President and General Manager
Hudson Coal Co.

THE job-training program now being carried on by The Hudson Coal Co. is a modification—forced on us by economic conditions—of one which the company started in 1915 and elaborated in 1925. Originally this program covered only the training of supervisors; today we are carrying on an active training program for workers as well.

Our first student-training work for college graduates started in 1915, when we hired three graduates of the School of Mines of Pennsylvania State College. The next year we hired six additional graduates from Lehigh and Penn State. These men followed a carefully prepared two-year schedule which included time in all our departments — engineering, production, transportation, acting as officials, on construction work, in the shops, sales department, etc.

Due to the first World War, this program was suspended in 1917. Nearly all of the men in training entered the army or the navy, but most of them returned to us after the war was over. The student-training program was resumed in 1920 and continued intermittently until 1925. Some of the men chosen did not finish the course, but many of them did and were placed in supervisory jobs, for which they have proved to be well qualified, as is shown by their steady progress in our organization since.

In 1925, the program was revamped, revived and enlarged and was put under the direct charge of J. D. Cooner, who was especially assigned to this duty and who had gone through the training before the war. Mr. Cooner spent his entire time looking after the students, examining their work, reading and criticizing their reports, and helping them in their studies, which they were encouraged to continue. From 1925 to 1929, 18 college graduates and 60 men who had been previously employed by us and had been singled out for special training finished the special courses. Most of them were placed in supervisory positions, principally in the operating department as sectional foremen. Those who showed inclinations toward other work were transferred to it.

Unfortunately, on account of the depression in our industry, it was necessary to give up this complete and thoroughly satisfactory program. We realized, however, that some sort of training was essential so that ambitious young men would have an opportunity to become better qualified for higher jobs. So in 1929, we arranged with the School of Mineral Industries of Pennsylvania State College to establish evening mining classes in three of the larger towns in which we operate — Scranton, Wilkes-Barre and Carbondale.

These classes were supervised by State College and were taught by qualified and certified teachers who were largely men employed by us in our operating department and who had generally taken the course of training first mentioned. These classes were open to any persons who desired to attend, but the majority came from our operations. The cost to the student was small and the classes were at first well attended. At present, there is only one such school operating in our district—at Olyphant, where two of our largest collieries are located.

Quite a number of our sectional foremen, realizing that their basic education was insufficient, have voluntarily attended these classes and have received additional training of great value to them and to us. These schools also have brought to our attention young miners and other employees who showed by their attendance at the school that they had the determination to improve themselves. These men were carefully scrutinized by us in our search for supervisory officials. Men of this latter class have been selected to become firebosses and sectional foremen. There are others in the group who no doubt will obtain like positions if they continue their studies.

A year ago, realizing that we had brought no young men into our organization since 1930, we gave summer jobs to four undergraduates from Lehigh and Penn State so as to enable us to become better acquainted with them and they with us, as well as giving them an opportunity to earn a little money to help them finish their college courses. Arrangements are now under way to have more of these students come to us this summer, but uncertainties regarding the draft make the conclusion of the arrangements difficult.

These college boys are given actual

Cadwallader Evans, Jr.

jobs, selected so as to allow them to acquire the widest possible range of experience in the two or three months available. None of the young men whom we had last year has been hired by us because all of them joined the army. We expect in the future, however, to secure a steady supply of technically trained men by this procedure.

Before we select any young man at college, we arrange to interview him, to study his college grades and his extra-curricular activities, and learn what the faculty has to say about him. Having made a tentative selection, we pay that man's expenses while he comes to visit us and thus give him an opportunity to look us over the same way we looked him over. In making such selections, we always give preference to local men and to men who have a family background of mining.

It has not been our practice to make any promises to men when they start as students nor to exact any promise from them regarding the length of time they stay with us. We tell them frankly what our other students have accomplished, what jobs they fill now, and what has become of those who left us. This leaves us free to drop a man who does not meet our requirements and leaves him free to quit if he finds he does not like our business after becoming better acquainted with it. Our mines and surface plants are open at any time for inspection visits. This fact is well known to the various mining schools in the East and in Canada, and a good many students, accompanied by faculty members, come to visit us.

During the last year, we have originated special training courses of about a year each for three promising young men from our organization. Two of these men are from the surveying corps and the third was a laborer in the mines. These training courses are modeled after the two-year courses which we formerly used, concentrating on those parts of that course which had to do with underground operations. We pay these men about the same amount as they received on the job they had before being specially assigned as students.

All students on our property are required to submit monthly reports in order to train them to think clearly and to express themselves briefly and to the point. These reports are carefully scrutinized by the student's immediate supervisor and by others of our general staff. Frank criticisms of these reports are returned to the students. Each student must keep the same working hours as the group in which he is employed.

Ignorance Induces Failures

Since a very large percentage of our coal is mechanically loaded, we have hundreds of scraper chutes, scraper loaders and other types of mechanical equipment. We found that many of the failures of these machines were due to lack of knowledge of the machines, not only by the men who are actually using them but also by the operating officials in charge. In order to overcome this trouble, we arranged, in cooperation with Pennsylvania State College, for special classes to enable these men to become better acquainted with the elements of design, basic construction, proper method of operation, lubrication and maintenance of all the various types of mechanical equipment used underground—including locomotives, hoists, shakers and scraper loaders.

Classes for these men are now being held once a week, two hours per session, and will continue for a total of 30 weeks. The course is divided into three parts of ten weeks each. At the end of each part, an examination is given and a man is not allowed to continue unless his work has been satisfactory and unless he shows promise of developing himself. The first part of the course includes elementary electricity and mechanics, and brushing up on mathematics. The second part includes detail study of the mechanical equipment and the third consists of detail study of the electrical equipment.

The endeavor in all of these courses is to make them extremely practical by using as teachers qualified men who are, in general, our supervisors and by having on hand in the classrooms actual examples of the various pieces of equipment which are being studied. Exactly the same course is now being made available for other employees, with the prime object of having these men who actually operate the machinery know what it is made of, what elements need attention and what practices must be followed in order to secure regular service.

All the candidates who applied to take this course were given an intelligence test by men from Pennsylvania State College and only those who passed this test were admitted to the course. Each man who attends is required to pay a few dollars, which covers only the cost of the text material which is supplied to him. It is our confident belief that these classes will be of tremendous value to the men who take them and of consequent value to us. We expect to extend these courses in the next year or so to include all our collieries—provided we can find sufficient men to act as instructors.

Safety Training Essential

No training work for either the supervisors or the actual workmen is complete without inculcating in their minds the elements of safety. Believing in this firmly, we are daily continuing through our officials to endeavor to teach all of our men safety-consciousness by keeping constantly before them the dangers that surround them and the necessity for protecting themselves and their fellow-workmen. In the execution of this program, we have from time to time adopted a variety of means to keep safety-consciousness before our men in a program which we never allow to become stereotyped or routine. Every safety suggestion that comes to our attention which can be applied to our conditions is adopted and given a trial.

In closing, the author wishes to acknowledge the cooperation of Mr. Cooner in the preparation of this article. Mr. Cooner, who was placed in charge of the 1925 training program as supervisor of students, is now assistant superintendent of Olyphant colliery.

WHAT IT TAKES TO BE

A Successful Section Foreman In a Modern Mechanized Mining Operation

How does the country's biggest bituminous mine select and train men for key positions in high-speed mechanized operations? What must a face boss in a mechanical-loading section know in order to keep his units working on a mass-production basis? Where can the various types of workers brought up under hand-loading methods be best fitted into the modern mechanical-mining set-up? John Foster, superintendent of New Orient, gives the answers in this article.

By JOHN R. FOSTER

Superintendent, New Orient Mine, Chicago, Wilmington & Franklin Coal Co.

UNDER hand loading, the miner was the important cog in the production and uniform flow of coal to the shaft bottom. He was assigned a working place, and it was his responsibility to keep that working place in good operating condition, to set all necessary props, and to see that the slide rails were in place so that the cars could be switched to the loading point. It also was his duty to see that the coal was drilled and shot so that it could be quickly and efficiently loaded and that it would yield a good merchantable product when it passed through the preparation plant on top.

In addition to safety and general supervision of miners and cutting-machine crews, the section foreman on a hand-loading territory was charged with the direct supervision of the day-wage men. This group constituted about 20 per cent of all the men under his supervision. It was necessary for him to keep his ventilation to the face, to do any required timbering except setting the straight props in the working places, and to keep his track in good operating condition.

The section foreman also was responsible for the movement of empties and loads from the working face to the main-line parting. It was not considered necessary that he see that the loader did a reasonable day's work of shoveling the coal into the car or that the cutting-machine men did a fair day's work of cutting. Why? Because both the miners and the machine men were paid on a tonnage rate. Since their earnings were in direct proportion to their efforts, it was assumed that self-interest would take care of their activities.

Under mechanization, the face boss not only retains all of his duties under hand-loading operations but has many added responsibilities. Mechanization has changed mining from a large number of individual loaders to a few mass-production units. These units very much resemble an assembly line in our factory production in that every man in the crew—which generally consists of 13 to 16 men, including the boss—has a definite operation to perform in each working place. These operations must be performed properly and on time or the uniform production of coal is interrupted.

The face boss on mechanical operation must be able to coordinate the work so efficiently that there will be a minimum of interruptions. He must be able to choose his men according to their ability to perform the particular work to which they are assigned efficiently and satisfactorily. Naturally, some of the jobs under mechanization are more important than others in that they directly affect the tonnage produced. However, if any single job in the process is poorly handled, it will interrupt and disorganize the performance of the crew. One of the most important duties of the section foreman, therefore, is to choose a man with the proper ability for the job. Second,

the foreman must be capable of giving clear, concise instructions on how he wants the work performed and also be capable of training the men to do their work correctly with a minimum of time and effort.

Another important part of the section foreman's duties is the regulation of his work so that the various jobs will be done in proper sequence. The activities of the crews must be so arranged that only one operation is carried on at a time in each working place. Such arrangement will eliminate unnecessary moving of the loading machine back and forth through the territory and the upsetting of the entire operation.

If a mechanical-loading operation is to be successful, the section foreman must understand in detail how the loading equipment works. He must be able to make an intelligent report on the condition of the machine at quitting time so that the maintenance crew can make any necessary repairs. By his observation he also must be able to anticipate possible major breakdowns so that he can have them taken care of before they become serious.

Must Understand Machine

In choosing a loading-machine operator, we have found that younger men who have been trained around machinery, such as the haulage units, are more successful than the older type of cutting-machine men. The haulage men usually are more active; they are more receptive to suggestions on handling the equipment; they recognize the importance of better maintenance of the loading-machine unit and are more accustomed to making clear, concise reports on the condition of the equipment when the shift is over.

In the selection of the second man, or helper, for the loading-machine unit, we always try to pick a young man who can develop into an operator. During the time he is a helper, we give him an opportunity to handle the machine at various times so that he will be able to take the place of the operator in case the latter should be absent.

The safety man, who is sometimes called a skin-up man, is a valuable asset to any loading-machine unit. His duties are to go into the working place prior to the entrance of the loading-machine unit to examine the roof, set or change any timbers where that is necessary, and to make the place safe and ready for the loading-machine crew. When the skin-up man has finished that particular part of his job, he goes back to the place where the machine is loading, watches the timbering and the roof, and does anything necessary to assist in the loading operation.

As soon as the loading machine leaves the place, the skin-up man sets any emergency timbers which may be required, scales the face or roof where needed, and leaves the place ready for the regular timberman. As this man's duty is principally safety work he must have a thorough knowledge of timbering and roof action, as well as dangerous face coal. So for that particular job we choose older men who have been capable miners and are well trained in this class of work.

The duties of the timbermen and tracklayers in a mechanized section do not differ from those they performed under hand-loading operations. Any man who was efficient in such work under hand loading, therefore, has proved efficient in mechanization. Duties of the cutting-machine crew also have not been changed in the transition from hand to mechanical loading. It has been our experience that good cutting-machine men under hand-loading operation also have made good cutting-machine men on mechanical-loading operation.

Drilling and shooting the coal for mechanical loading, however, are not only very important in successful operation but involve a new class of work. Under hand loading, a good miner drilled and shot the coal in one place day after day and became very proficient in this particular phase of the work. In mechanical loading, the drilling crew prepares all of the working faces. Therefore, such a crew must become proficient in the location and selection of the drillholes and in judging the quantity of explosive necessary to break down the coal.

Machine cuttings must be thoroughly removed from under the cut to give the explosive an opportunity to shear the rib and loosen the coal in the face so that the machine can easily load the coal as well as deliver a good merchantable coal into the railroad cars. No amount of additional powder will take the place of the removal of machine cuttings from under the cut or overcome difficulties encountered from improperly drilled holes. We have found that experienced, conscientious miners who prepared good coal under hand loading have made the best men on the drilling crew.

The duties of the motorman have not particularly changed with mechanical loading. We have had little difficulty in adjusting the men from the hand-loading operation in this class of work to that under mechanical operation. This also is true with respect to tripriders.

Our experience with mechanical loading has demonstrated to us that the most important factor in its successful operation is our choice of a section foreman. The successful section foreman must be capable of coordinating his work and of making a proper selection of his men for each job. He must be able to give clear, concise instructions as to how the work is to be carried out and he also must have sufficient mechanical ability and knowledge to make a concise report on the condition of his equipment at the end of each shift. On top of that he must have the ability to obtain the full cooperation of his men and to keep his territory in safe operating condition at all times.

BETTER SAFETY RECORDS

Achieved With Mechanical Mining Where Management Guards Against Hazards

MECHANICAL mining not only produces more tons per man-shift than hand loading, but also can—and has—cut the toll of accidents. How to capitalize on the safety advantages inherent in this system while guarding against the new hazards it introduces is here discussed by the safety engineer, the operator and the manufacturer. Although written independently, the three approaches have much in common. And there is general agreement that "the ultimate result of mechanization should be a reduction in our accident record."

I—As the Bureau of Mines Sees It*

By J. J. FORBES

Supervising Engineer, Safety Division
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ABOUT 30 per cent of the tonnage from underground mines is mechanically loaded. No data showing the ratio between accidents in mechanized and hand-loading operations for the country as a whole, however, are available. Experience indicates that for a year or more after mechanization is introduced in a mine the accident rate increases, but ultimately accidents decrease.

Within the last ten years some extremely good accident records have been established in highly mechanized mines. In Illinois and Wyoming, where probably the greatest advances have been made in mechanization, accident records have been greatly improved. For the country as a whole, however, the record on an exposure basis the last three years has improved but little over the average for the 20-year period preceding 1930. Mechanization, it is generally admitted, introduces added hazards, but it is also believed these hazards can be readily controlled. The ultimate result of mechanization, therefore, should be a substantial reduction of our accident record.

Adequate supervision and training of both officials and employees in handling equipment in mechanical mining are of primary importance in preventing accidents. Unfortunately, in many instances mechanical equipment has been introduced without commonsense regard of the additional and new hazards and without proper training of personnel. Such practice is bound to result in inefficiency, increased accident frequency and probably in increased severity. The concentration of workers in mechanical mining permits closer supervision, but in some instances this supervision is inadequate because foremen are required to do work other than that of a supervisory nature. Where such conditions exist, best results in preventing accidents cannot be expected.

Multiple-shift operation is not always conducive to good supervision. Too often the night shifts are neglected and the best foremen placed on the day shift. Foremen on one shift tend to place responsibility for unsafe conditions upon foremen of other shifts, especially when three shifts are worked. With triple-shifting, not enough time elapses between shifts to allow for proper care of equipment and other necessary work that cannot be done on shift. Moreover, rock-dusted areas often cannot be properly maintained because of lack of time.

Six of the seven major explosions

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in the 13 months beginning with January, 1940, occurred in mechanized mines. While this is not necessarily an indictment against mechanization —as Illinois, Indiana and Wyoming, all highly mechanized States, have not had an explosion for several years —it does indicate that adequate precautions are not being taken to guard against such disasters.

It is generally agreed that explosions can be prevented if well-known basic safety measures are adopted. These basic safety measures are:

1. Adequate ventilation properly directed to working faces.
2. Proper supervision and inspection for gas.
3. Elimination of all possible sources of ignition, and installation and proper maintenance of permissible electrical equipment.
4. Allaying of coal dust at its source and prevention of accumulations of dust.
5. Adequate rock-dusting.
6. Use of permissible explosives or permissible blasting devices, used in a permissible manner.

Adequate ventilation properly directed to working faces is necessary in mechanical mining because of the increased liberation of gas and dust. Ordinarily, it is necessary to increase the volume of air over what was used during hand-loading operations. But this should not impose a hardship, as fewer working places are necessary. Because of the rapid development of working places, there is a tendency to depend too much upon temporary means of controlling ventilation. Doors are used where overcasts are safer; canvas stoppings are employed where permanent incombustible stoppings should be installed, and crosscuts are not made as frequently as they should be. All this results in the use of extended lengths of line brattice. Too much dependence also is placed upon blower fans for supplying ventilation at the face.

Obviously, adequate supervision is essential for both efficiency and safety. Thorough inspection for gas also is essential. In addition to the regular inspections by firebosses and foremen, special inspections should be made before and after blasting and before electrical equipment is taken to the face.

Electric arcs are the most prolific source of explosions. Mechanical mining has greatly increased the possible incidence of such arcs. The remedy for this hazard is chiefly the installation of permissible equipment and painstaking maintenance of this equipment and other electrical accessories.

Mechanical mining produces a greater quantity of fine coal dust during a cycle of operations than under hand loading. This dust is both an explosion and a health hazard. Allaying dust during mining and loading operations by water sprays on mining and loading machines is being done effectively in some mines. Wetting the face region before and after blasting and wetting empty and loaded cars assist materially in preventing dust from getting into suspension. Where water supply is limited, a wetting agent added to the water is being successfully used.

Rock Dust Helpful

Application of rock dust to underground surfaces has been an important factor in preventing widespread explosions. Many, however, have applied rock dust without much apparent consideration to the quantity required to prevent propagation of flame. Some have rock-dusted haulage entries only and hoped that, if an explosion did occur, it would follow down the aircourse entries. Such practice is folly and a waste of money.

Explosives have been responsible for several disastrous explosions in the past several years. In the interest of safety, black powder should be outlawed from all coal mines. Misuse of permissible explosives can cause, and has caused, explosions. Where it was the practice for miners to fire their own shots, mechanization under some conditions has reduced exposure to explosive hazards. Competent men, however, should be employed to handle and use explosives. Only permissible explosives and permissible blasting devices should be used, and then only in a permissible manner.

Owing to the reduced number of working places and the concentration of workers, mechanical mining offers a better opportunity to control roof than hand-loading methods. Concentration of workers, however, may subject larger numbers of persons to serious accidents from any single fall which may occur. Roof conditions vary. Experience should indicate the method of support best adapted to particular roof conditions. Based upon this experience, a standard schedule of minimum roof-support requirements should be formulated—and strictly followed.

Mines with bad roof generally have fewer roof-fall accidents than those with so-called good roof conditions because the hazard usually is recognized and guarded against. Some mechanized mines have reduced roof-fall accidents by increasing the quantity of timber used. Light-weight metal crossbars supported by screw jacks are successfully employed for temporary support at the face in many mechanized mines. Use of crossbars permits free movement of mining machine and loader and avoids having temporary posts. Many accidents have occurred through delay or failure to replace posts that have been removed. Adjustable props and screw jacks are used extensively for temporary timbering, especially in conveyor mining.

Although definite advantages favor the reduction of roof-fall accidents in mechanical mining, certain factors tend to increase such accidents. The noise made by cutting and loading equipment makes it difficult, if not impossible at times, to hear the usual warning sounds given by loose roof or rib material before it falls. Equipment used at or near working faces should be stopped at frequent intervals so that any sounds or signs of roof movement may be detected.

Haulage accidents in mechanized mines should be fewer than in hand-loading operations because exposure to such hazards is greatly reduced. But the speed-up of haulage, especially car movement at loading points, necessity for pushing cars and increase in size of cars and other haulage equipment all increase these hazards. In some mines the increased size of cars has so reduced clearance along haulageways that hazards there have been increased materially despite the fact most State mining laws require definite clearance. Haulage accident fatalities have been reduced about 28 per cent during the last five years compared with the average for the preceding ten years. This indicates that mechanization may have been a factor in the reduction.

Normally, accidents from explosives, electricity, machinery and miscellaneous causes account for about 15 per cent of the total mine accidents. With the greater use of machinery, accidents caused by machinery may be increased if ordinary precautions are not taken. Proper training and strict discipline are important factors in preventing such accidents.

The greatly augmented use of electricity, with the necessary increase in the amount of wiring, trailing cables and other accessories, creates an ample opportunity for increased electrical accidents. Fire, contact and explosion hazards are certainly in-

creased. The speed with which mechanical operations are carried on and the tendency of crews and foremen on one shift to leave necessary repairs to the following shift are not conducive to good maintenance. This fact is borne out by observation in many mines of the haphazard manner in which cable splices are made and equipment is maintained. In too many cases permissible equipment has been rendered non-permissible because it has not been maintained in permissible condition. It is essential that competent men be employed to maintain electrical equipment.

Where sincere efforts are made, accident records can be reduced through mechanization. There are potential hazards in all mines, but, if well-known principles of safety are applied, they can be controlled. Unless management recognizes hazards and takes the necessary steps to correct them, however, accidents will continue to occur. Far too many operators continue to use practices which they should know have resulted in numerous accidents.

The operator has a greater responsibility in preventing accidents in mechanized mines than in hand-loading mines because under the changed methods the activities of the workers are more definitely under his direct control and guidance. If he has not properly trained employees in the new methods, if equipment is not properly maintained, and if he does not provide adequate supervision, the responsibility for accidents is then his.

II—From Operator's Viewpoint

By W. J. JENKINS

President, Consolidated Coal Co.

NEXT to the satisfaction of conducting business on a high moral plane, with happy and contented, accident-free workers, come the dividends which safety makes possible. A mine conducted without safety has to pay large compensation to its miners, heavy bills for damages to property, especially in case of an explosion, and quite usually ends up "in the red." Many a company, if it had attained a better injury and fatality rate, would have reported a profit balance to its directors at the end of the year.

How important accident costs are in economy of operation is well demonstrated in a report made by J. J. Forbes and C. W. Owings in U. S. Bureau of Mines I. C. 6896. This report, covering accident-cost data for most of the commercial bituminous mines east of the Mississippi River from April 1, 1934, to Jan. 31, 1935, shows an average profit of only 2.62c. per ton. The average cost of compensation, however, was 4.90c. per ton, or 2.28c. more than the profit. Coal mines in Illinois, Indiana, Ohio and West Virginia showed an average profit of 6.85c. per ton compared with a compensation insurance of 4.59c. per ton.

The mine loss per ton in the mines studied in Alabama, Kentucky, Maryland, Michigan, Pennsylvania, Tennessee, Georgia and Virginia averaged 4.46c., whereas the insurance cost was 5.42c. per ton. If the actual cost of accidents had been reduced to a cent a ton, coal in all these States could have been produced without loss. The cost of compensation insurance was nearly a cent a ton higher in the States where coal was produced at a loss than in the States with a profit.

That mechanical mining under safety-minded management results in substantial reductions in accident rates is illustrated by the records of the mechanized mines in southern Illinois. In 1933, fifteen mines in that area which loaded two-thirds or more of their output mechanically had a fatality rate of 3.26 per million tons, against a State average of 2.12 for all deep mines. Man-days of exposure at these fifteen mines averaged 38,000. By 1939, however, 28 southern Illinois operations loading two-thirds or more of their tonnage mechanically had a fatality rate of 1.92 per million tons, compared with a State deep-mine rate of 2.33; man-hours of exposure per fatal accident had risen to 62,500 at these 28 operations.

In the case of our own company, tons per compensable accident increased from 4,516 under hand loading in 1927–28 to 20,170 tons under mechanical loading in 1939. Cost per compensable injury accident dropped from $292.62 in 1928 to an average of $252.00 for the 13-year period 1927–39. Total accident costs for the five-year period 1935–39 were 5c. per ton less than for the 1927–28 period under hand loading.

With such increased activity in the industry as now is already beginning to obtain, accidents which lay a mine idle place a still heavier burden on the mine exchequer than that stated in I. C. 6896. Under such circumstances with a market hungry for coal, the cost of idle time then must be added to the other losses. Property damage wrought by explosions, derailments, collisions, mine fires, squeezes, floods, and sometimes even by rock falls that bury equipment and track and close workings, of course, always should be charged against accidents. These material losses may be even more considerable than compensation bills, especially in those instances where injuries fortunately are avoided.

But the company is not the only party that will obtain dividends from safety. As the compensation paid is not equal to the statistical loss of wages of the employee, he or his family or both still retain a financial interest in his life and limb as well as an interest that is even more immediate—in their freedom from pain and anxiety. When he makes his report to his own little company—his wife and children—he may well show safety even more remunerative to them than to the company.

Safety is everybody's interest from president to trapper boy, and no one can avoid the responsibility this fact lays on him. No official in charge

leaves the operating, selling or real estate problems to his subordinates. Why, then, completely delegate safety to others? The company's president should be as alive to this subject as anyone, even though some men may have safety as their main duty.

Safety is much like the throw on a gambling table: you may place your bet against the wheel for a while and appear to be breaking the bank, but eventually the bank will win, for the odds are against you. So also with safety, even though the chances are dead against you: for a while you may win, and this fact makes some people who are supposed to be promoting safety, negligent in that duty.

So, lest that disposition exist, safety is a matter to which the controlling executive must give his serious consideration. When those who are in active operation of the properties realize that their immediate superiors stand ready to back increased safety, financially and otherwise, intelligent planning rather than wishful thinking may be anticipated.

It is not sufficient for the chief executive to assume that his associates are doing everything possible. He should inquire personally as to the way in which each specific problem has been attacked. He should not wait for an accident or a bad report on compensation cost or on frequency and severity ratios to spur him to action. He should himself meet with his subordinates, analyze the results, make suggestions, etc., for he, as well as the man at the mine, is on trial.

Particularly is safety an issue with installation of new mechanical devices that inevitably introduce specific hazards. Mining by hand had its dangers and gradually defenses have been provided against them, but with a new set-up come new problems, not perhaps in themselves mechanical but relating to dust or to ventilation. Just as planning is necessary to fit the machine into the operational economy so a scheme is needed that will coordinate it definitely with the safety program, and this fact is sometimes forgotten by manufacturer, coal operator and management. To visualize dangers requires as much effort and "thinking through" as to foretell difficulties in operation, time losses and bottlenecks.

Too often safety is accepted in principle but ignored in practice. It is frequently difficult, therefore, to inculcate safety-consciousness in the men, and every mine manager and foreman finds he has to "sell" a product to an unwilling purchaser. But the sale must be made, the training must be given, and the more pleasantly and firmly it can be done, the more successful the result will be.

As the war develops in Europe, new devices for destruction are discovered and new counter devices invented. So also, in the prolonged battle for safety: accident hazards multiply and are modified, and management must be alert to multiply the means of defense. What might have served yesterday may not serve today.

III—Safety Squarely Up to Management

By J. D. A. MORROW
President, Joy Manufacturing Co.

WHETHER mechanical mining is synonymous with safer mining rests squarely with management. The machine does not automatically produce fewer accidents any more than it automatically produces lower costs. That is the job of management in planning and coordination. While use of loading equipment does eliminate certain hazards, it also introduces new ones. Some of these are inherent in the transition from hand to mechanical loading and disappear when that transition is over. Others are continuing hazards which can be avoided only by foresight and proper safety regulations strictly enforced.

Two separate and distinct groups of hazards must be recognized. First are those which may cause accidents to individual workers and equipment in current daily operation. The second group involves hazards which may cause an explosion with heavy loss of life and widespread property damage. Definite, effective remedial action must be devised for each group. Where this is done, mechanization offers the opportunity to have better and safer mines than ever before.

Hazards arising from inexperienced crews under inexperienced management when mechanization is introduced head the first group. Accidents are more serious and frequent where mechanization is started in a mine previously on hand loading than in a new operation. So much must be unlearned in the old mine, so many old traditions and procedures must be completely changed.

Other accidents in the transition period may come from badly planned production functions. They grow out of the consequent hurry and confusion of disorganized production by men trying to make up time lost because working places have not been properly prepared for the next step in operation. Where management does its part, trains crews properly, establishes a well-planned, properly balanced cycle of operation in which men know their jobs, these hazards of inexperience presently disappear.

There are other new hazards, however, which will yield only to specific managerial action. For years falls of roof and coal have been responsible for approximately half the fatalities and one-third the non-fatal injuries underground. Because the mobile loader removes hundreds of men from working immediately adjacent to the face under newly opened—often dangerous—roof, this greatest of all underground hazards is fading in mechanized mines.

But the loader introduces new face hazards of its own which require specific attention. When the machine is loading out a room or entry face a larger area must be kept clear of permanent timbers than in hand mining. This area, however, can be supported temporarily with steel jacks or H-beams, the first set about 3 ft. from the face and the others at appropriate intervals far enough back from the face to provide a steel-beam-protected working area for machine and crew. Permanent timber replaces these jacks and beams as the working face is advanced. Some mines also have changed from the usual straight-across working face to the wing- or double-wing-face, depending on the extraction method. This greatly reduces the open roof span and, with steel-beam protection, sharply reduces roof hazards.

Improper cutting and shooting also may cause face accidents. With hand loading, the loader trims up the pillars to keep them straight and free from overhang. With mechanical loading and no change in cutting procedure, however, the cutter soon creates danger from ragged pillars and faces. Overhanging and round cuts interfere with proper shooting and constitute hazards for machine crews. Education of cutters, closer check by foremen and strict observance of measures to insure proper cutting

and shooting will end these hazards.

Better training of the machine runner will reduce the accidents which may occur when the operator, loading out a place, gets caught between the machine and the pillar. In some cases, when the operator regularly works on the tight side of the loader, the controls have been changed to the opposite side of the machine to place him in the clear. Some machines have been equipped with controls on each side.

Haulage accounts for about 20 per cent of all underground accidents. With gathering locomotives and conventional mine cars back of loading machines, there usually is increased risk because much more concentration and faster service are required. To overcome such hazards management improves trackwork and maintenance. Outer rails on curves are raised to avoid derailments. Coupling hooks are used. The number of car changes and haulage movements may be reduced by installing larger cars. Better track and a slow tramming on curves reduce or eliminate accidents due to loading machines going off the track on curves.

The noise of their machines may prevent cutters and drillers hearing cars approaching. This means danger from runaway cars, particularly on the dip. Some mines equip cutting and drilling machines with light derailers which must be clamped to the rail some distance out by the workmen when they enter the place. This safeguards them from runaway cars.

All the secondary-haulage accidents mentioned disappear when track is removed and shuttle cars are used. But the shuttle car brings its own hazards. It moves rapidly and silently; men must learn to anticipate its movement. A warning horn and bright paint so that the unwary eye will more readily catch the movement of the car against the dark background of the mine helps.

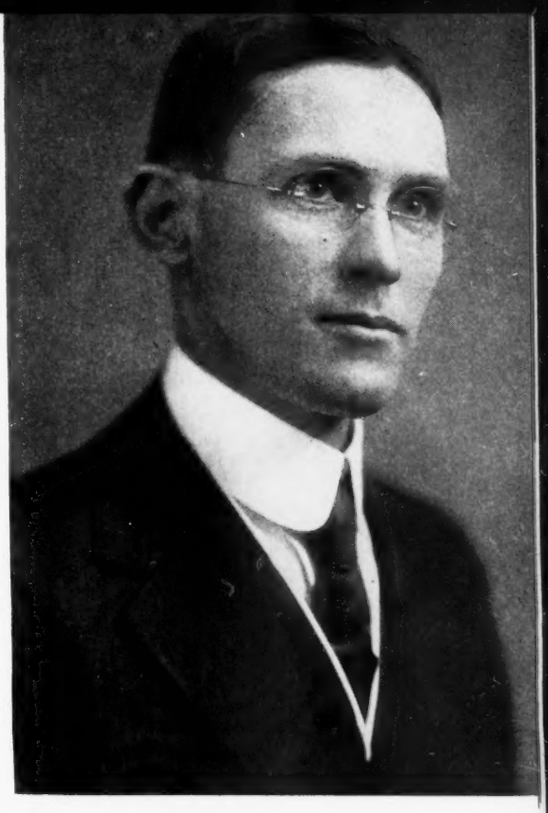
Mine explosions may happen in operations with excellent daily safety records. Effective catastrophe prevention necessitates anticipating the peril, establishing sound procedure to forestall its development and maintenance of operating practice that promptly discovers the peril, if it does appear, and instantly applies adequate counter measures to dispel it.

One of the chief sources of such peril is accumulation of methane in explosive concentrations. Loading equipment operating on multiple shifts opens up fresh faces from which gas may escape more rapidly and extensively than with hand loading. Development under such conditions must be planned long in advance so that in dangerous areas the splits of air are shorter and, if necessary, because of sudden and rapid liberation of gas, new overcasts can be quickly erected to divide a split still further. Ample ventilating equipment must be installed and maintained. Approved explosion-proof equipment must be kept in that condition. More frequent and careful inspection must be standard practice. Methane indicators should be used wherever necessary.

Safeguards established by several companies to prevent methane accumulations in gassy mines include the following: Ventilating current is locked by double doors to maintain a constant uninterrupted flow of air throughout each split. Men leaving any door open unnecessarily are promptly penalized. Areas between doors are constantly ventilated to guard against gas accumulations there. Crosscuts are closed with doors and stoppings. Line brattices have strong supports and are inspected at the end of every shift. Once a week an official takes readings throughout the mine with an approved methane indicator. An official must test for gas whenever he enters a split. When any split shows a tendency to an increased methane percentage, the fireboss tests it with the indicator.

If a heavy gas feeder is struck, the power lines for that area and others which may be affected are immediately cut. All safety lamps are extinguished, the men are removed and the mine foreman is notified. Barriers are erected and proper danger signs placed at all entrances to the affected area. The assistant mine foreman in charge of that section, or a relief man, must stay there until the danger is eliminated.

In mechanized mining, large quantities of explosives must be transported and stored in or near the actively working sections. Here is another recognizable danger that may cause disaster. Many operators have eliminated this hazard by using other mediums than powder to break down the coal. Where carbon dioxide is used, however, there is a danger from flying shells. To avoid this, many mines require that no holes be drilled on the solid and that the charged hole must be covered with a post or tie to deflect any shell that does fly out. The shotfirer must carry at least 125 ft. of cable and must get around one—two if possible—90-deg. corners before firing any shot.



J. D. A. Morrow

One of the first safeguards against the mine-fire catastrophe hazard is quick discovery and extinguishment. Smaller working areas and more frequent inspection help the mechanized mine to prevent such fires. Many mines using carbon dioxide for blasting also use that gas successfully to extinguish incipient fires.

Accumulation of coal dust is another catastrophe hazard. Reduction of production at the source and rock-dusting are the standard defenses against this peril. Several States require sprays on cutter bars. Some operators have discovered ways to reduce the dust made by a cutter bar as much as 85 per cent with a small quantity of liquid and at low cost per ton. Where spillage from shuttle cars creates a dust hazard, the obvious remedy is more careful loading, current cleaning of travelways and, if necessary, sprinkling them with a dampening agent. Such preventive measures cost little.

In spite of all preventives, coal dust necessarily will be made in some volume and will accumulate on exposed faces throughout the mine. In many mechanized mines, therefore, it is standard practice to rock-dust all surfaces regularly so that dust sampling will show not less than 65 per cent of inert material in dust anywhere in the mine. Rock dust should be applied also in developing entries to within two cuts of the face before cutting. All entries should be rock-dusted frequently with high-pressure machines.

INDUSTRIAL LEADERSHIP

Must Be Assumed by Management To Protect Future for Bituminous Mining

What coal needs is the same pride in its importance in world affairs that steel and automobile manufacturers hold for their industries. To justify that pride management must accept the major responsibility for the success or failure of its operations. That calls for aggressive leadership in every phase of the business—with accident prevention high in the list. Unless management assumes such leadership, warns Mr. McAuliffe, it will eventually find that organized labor and an expanding Washington bureaucracy are writing all the rules.

By EUGENE McAULIFFE

President, Union Pacific Coal Co.

I AM ASKED by *Coal Age* to say what, in my opinion, is the future outlook for the industry, and what can be done to forward its security and betterment. Before me lies a reprint of "The Compleat Collier," a little booklet of less than 60 pages, covering "the whole art of Sinking, Getting and Working Coal-Mines, etc., as is now used in the Northern Parts, especially about Sunderland and New-Castle." Originally printed in London in 1708, this treatise tells of methods that to a considerable extent yet apply to the coal mining industry of America.

Wherein lies our future? When coal was first mined in Great Britain, wood and its product, charcoal, was the common fuel of England. The power of steam was unknown; smelting iron and tin ore with charcoal and burning lime with wood were the chief fuel-consuming industries. The Scotch and Irish relied largely on peat for domestic fuel. Newcomen and Watt harnessed steam; then followed the locomotive and the steam-driven vessel. With the advent of the cotton gin in 1793, the old feudalistic, provincial world gave way to world empire with trade the dominant motive behind every human effort.

I mention "The Compleat Collier" —the first treatise ever written on coal mining—because coal, more than any other industry, is still following the trail blazed by the pioneers of northern England 250 years ago. Woeful waste of a rapidly exhausting invaluable natural resource, archaic hand-mining methods, poor ventilation responsible for frequent mine explosions and a too general acceptance of the theory that accidents must happen constitute the sins of omission and of commission that, to a large extent, yet attach to the industry.

Let it not be understood that the industry as a whole thinks in terms of America's early mining days; that is not the case. There are enough administrators scattered throughout the nation's coal fields who are obtaining a defensible measure of extraction, of employee safety, quality of preparation and dependability of service to prove the premise set out in the preceding paragraph.

But what has been done in other industries since the turn of the century? To the locomotive has been added the mechanical stoker, which alone made it possible to double and treble the rate of fuel consumption and consequent steam production, increasing tractive power correspondingly. With the stoker came the superheater and the feed water heater, higher steam pressure and temperature, plus other lesser improvements, all of which have made the modern steam locomotive one of the most efficient mobile power plants in the world.

Our steam-driven electric power plants all came into their present high place in the last 30 years. Major credit for this development and the electrification of the nation, at costs per kilowatt-hour so low as to seem almost incredible, largely belongs to the men who administer them. The evolution of the automobile, with boys who came in off Midwestern farms handling machine tools that turn out parts ground to 0.001 in. exactness, is another example of progress unsurpassed. Thousands of the men who are an integral part of this miracle industry once worked in our Central Region coal mines.

Although the sentient world still looks upon any underground task as something apart from all other forms of industry, we long ago concluded that mining coal was merely manufacturing a usable product out of the raw material that nature stored eons ago. When nature laid down its stores of vegetal matter and next covered it up to improve its quality, the first step was completed. To get it out economically and safely, and thereafter to properly prepare and market the finished product is merely

the second step, and this, after all, is where we either succeed or fail.

What of the future of the industry, and what can we who administer it do for its well-being and security? Let us start out with the understanding that fuel oil, natural gas and hydro-electric power are and will remain secondary to coal as the foundation of the world's industrial life. Perhaps what we most need is the same belief in the importance of coal mining in world affairs that the steel and automobile manufacturers hold for their industries. With this principle well established, what then can we do to strengthen one of the most important industries in all America?

Labor Not Only Factor

First, we must abandon the belief, altogether too prevalent, that labor is responsible for the success or failure of any given property. Labor enters the field only after capital decides when and where it will establish a mine, and labor injected itself into coal selling only after rugged salesmanship confessed failure. Labor came in here by way of the Guffey bill. Many operators who opposed it; who "came to scoff," so to speak, are now "staying to whitewash." There are those who will continue to oppose the law (while obeying it) because it represents industrial regimentation, and the hamstringing of the principle of the free conduct of business. It savors too much of Continental Europe for many.

A substantial portion of the industry long ago abandoned the methods of mining set forth in "The Compleat Collier" for those more comparable to methods employed by other progressive manufacturers. Too large a fraction, however, yet lags in the introduction of improved methods, including the latest type of machinery for *coal manufacturing* purposes. Although cutting machines were introduced during the last century, approximately 15 per cent of the nation's coal is still shot off the solid. Mechanical loading devices came into use about 20 years ago, but some 72 per cent of our output is still loaded by hand. How many coal mining men have entered into the design and adaptation of machinery for coal loading? I am afraid the honors go to other branches of industry. Incidentally, we owe the manufacturers of machinery and supplies a considerable debt. They have done a lot of pioneering.

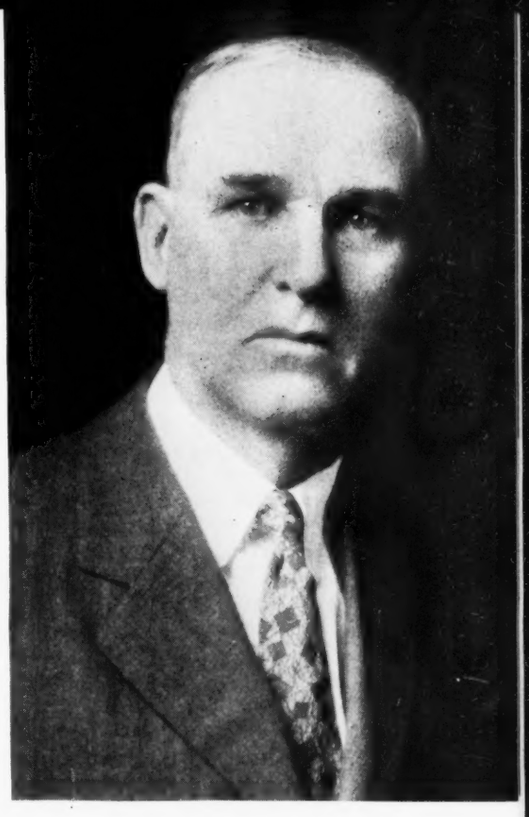
Take safety. Time after time the industry gets a fresh black eye out of a mine explosion, with all the gruesome details played up in the newspapers. Do these tragedies bring about better ventilation, rock-dusting, water on cutter bars, sprinkling dust at the source and on roadways, and the other proved preventives we all know about? Such, unfortunately, is not the case; we clean up the mine, pay the workmen's compensation, and get back on production.

Why should our accident rate be quite four times that of the British mines? Will it take the British theory of more rigid laws and law enforcement to lift us out of the condition we are in? Why, as an industry, have we not made the same ratio of accident reduction achieved by the railroads, the steel industry and manufacturing in general? Again, are the United Mine Workers, through legislation, to further become our pace makers? It is important that owners and management make a more serious effort toward accident prevention. Our failure in this direction is doing more to hasten new regulatory laws than our failure to sell coal at a profit.

There is a rapidly growing inclination on the part of a substantial portion of our intelligentsia—educators, churchmen, politicians and writers—to take sides with the so-called underprivileged. That the under-privileged does not make much of an effort to help himself does not enter into the situation. The numerous social security laws with attendant heavy taxation of industry to support them are only one phase of this movement. The Guffey law has not only broken into the privacy of our heretofore sacrosanct costs and realization sheets but its agents are now measuring our tipple screens and looking into our mining processes. We are paying several million annually in excise taxes and district assessments for the law's paternal attentions.

Must Take Leadership

We should, and without further delay, make up our minds to take the full responsibility of leadership in the conduct of the industry. City resident administrators who never go into their mines—many are too old and too stout—have failed to absorb the implications of the new dispensation. They fail to vision the manufacturing viewpoint, look upon their labor as a necessary liability to be repurchased in March on odd years, and depend on Goodman, Jeffrey, Sullivan, Joy, and a host of other manufacturers to mechanize their mines on a "make-good" basis.



Eugene McAuliffe

There is not a mine in the country capable of producing 100,000 tons annually that cannot be successfully mechanized—and they can all be made reasonably safe. The little mine no longer has a place in the coal economic situation. The record of inadequate wages paid, poor preparation and—worst of all—high accident ratio in the thousands of small mines justifies this conclusion.

Human nature, as expressed in the mine worker, is no different from that of other human beings. We know that we can get along with 2,400 mine workers, but we would dread the task of trying to secure teamwork from an equal number of clergymen or doctors of medicine.

The industry has a substantial measure of labor control at the present time. The Guffey law has prescribed our selling prices, and a further measure of control in the form of a new mine safety law is "just around the corner." Will we continue to retreat, step by step, to find eventually that a battalion of newly hatched bureaucratic lawyers in Washington are writing all the rules? Without attempting to be facetious, we are given to wonder if the quickest way to bring about a coal mining renaissance might not lie in the direction of moving all administrative and operating offices below ground, bringing us nearer to the work and to what is on the worker's mind.

FUTURE OF ANTHRACITE

Rests on Personnel Building And Discarding Progress-Killing Traditions

Personnel looms large in the anthracite picture. So large that the future of the industry is linked with its ability to attract young men to adopt anthracite as a career. This means that the financial rewards must be adequate. There also must be a break with traditions which interpose obstacles to progress. "Management and men in this industry," declares the president of the oldest anthracite producing company, "are both impregnated with these traditions." Both must recognize the impact of change in building for the future.

By J. B. WARRINER

President, Lehigh Navigation Coal Co.

PROBABLY in no other industry are considerations of personnel of more importance than in anthracite. In no other industry of its size does the man-power cost constitute from 65 to 70 per cent of the total cost of production. And the limitations on the use of mechanical means because of physical mining conditions—especially in the Southern field of the anthracite region—are likely to perpetuate this situation. Therefore, any consideration of anthracite's future must deal largely with personnel problems.

Personnel problems relate in more or less distinct ways, but equally, to the supervisory forces or management and to the rank and file of workers. These two classes of employees, however, have a good deal in common. Even the higher officers are employees primarily rather than owners. Generally speaking, the supervisory forces are part of the same environment as the laboring forces and a large proportion of them come up from the ranks.

Anthracite is an old industry as time is counted in this country. For that reason it has accumulated a body of traditions and conditions which, though often advantageous, sometimes impose obstacles to the use of those more progressive methods which are so important in times of keen competition. Management and men in this industry are both impregnated with these traditions.

The general background of anthracite requires only a passing reference. For nearly one hundred years the industry had almost a monopoly in its marketing area. This fact is traceable in a very large degree to the superior quality of the fuel and the unwillingness of the people in the Northeastern States to use anything in its place. Up until the time of the last World War, for years the supply of anthracite had been about in line with demand. During the war years, this supply actually fell short of the potential demand.

Under such conditions, it was easy to operate an enterprise profitably without the same intensive concern for costs which animated other industries. After the War, increased prices brought about by wage adjustments, increased taxes, etc., started a shift to other fuels. The tempo of this change increased rather suddenly after the strikes of 1922 and 1925–1926. The producers of other fuels and the manufacturers of appliances for burning them took over from a third to a half of anthracite's normal trade.

Thereupon the anthracite industry was confronted with a need for drastic reductions in cost and improvements in the product. Consumers would no longer support it in the style to which it had been accustomed. That these developments were not anticipated by the industry as a whole is something of a reflection on its personnel. Nevertheless, in a measure the coal companies met the challenge by improving the quality of their merchandise, by introducing mechanized methods of production, and by eliminating some of the grosser forms of waste.

The impact of the new conditions fell heavily on all members of the industry. It was hard to believe that the long period of comparative stability and opulence was coming to an end and that drastic readjustments must be made. There was, as a result, resistance to adjustments either in the form of eliminating producing units or of reducing wages. In some cases it is probable that adjustments were too drastic. In others, the resistance to adjustments of any kind was ill-advised and the result was total loss of investment and of employment.

Out of all this the industry developed a new personnel problem of very great magnitude and complexity. But from past experience and failures may be summoned a vision of future

needs and accomplishment. One of the things which some of the companies at least have undertaken to do is to secure on the part of the personnel a more complete and general understanding of the fundamentally changed conditions. In the past it would appear that nothing except the impact of events has spoken eloquently and convincingly to the personnel. This situation, however, has been changing very rapidly in the last few years; men as well as management seem in a growing degree to understand the necessity for more economical operation.

But this understanding must be greatly enhanced and must be translated into practical and technical terms. It must be more generally appreciated that mechanical and organizational devices for controlling costs cannot be obstructed except at an ultimate cost to the workers themselves. These lessons cannot be taught entirely by precept and the full burden of adjustment must not be laid entirely on the men. An even larger responsibility rests upon management. Management must realize that modernization of its concepts of education of personnel and cooperation with all interested elements in the industry are as important as modernization of its mechanical plant.

Training Necessary

Knowledge and understanding do not come alone from routine daily experience. There should be training, discussion and study of industry problems outside the ordinary routine of daily production. Some of the companies have been giving such instruction or training to their personnel and have profited considerably by it.

While it is inevitable and proper that the main body of supervisory men must come from the ranks, at the same time there is a need for a greater infiltration of technically trained men. The practical men, too, must be given greater opportunity for technical training. In spite of the limitations on mechanization previously mentioned, the larger companies have resorted to an extensive use of modern mechanical and electrical equipment in transportation, ventilation, pumping, etc. To leave this whole matter up to men educated only by experience is to put the industry at a very great disadvantage and to perpetuate some costly practices.

There is also need for trained minds in the process of extraction or mining. In this basic operation the industry

suffers by its adherence to traditional practices. It is frequently stated—perhaps with some truth in many cases—that the present generation is mining anthracite in practically the same manner as did its fathers and grandfathers. The percentage of coal recovery is not what it should be. Mechanical means of removing coal at the face to preserve commercial values is far short of the industry's requirements. Although vastly improved over a period of years, the safety record still leaves much to be desired.

There is considerable opportunity in the industry for research in every phase of operation and marketing, including operating methods, the suitability of materials, new uses for coal and coal wastes, new types of burning equipment, etc. While, as is shown by the efforts put forth by the originators and backers of Anthracite Industries, Inc., the industry has not been altogether neglectful, comparatively few of the individual companies have given this type of activity the encouragement it should have. There also is much indifference and even some hostility toward technically trained men and new ideas. There should be no place for such an attitude in anthracite. It needs all the help it can get.

Because of past attitudes and present conditions, the industry has not claimed the interest of teachers and students in the engineering schools for a long time. It is significant that at colleges that have the best mining courses almost none of the recent graduates has indicated a desire to enter the anthracite industry. Such men prefer the more progressive field of metal mining.

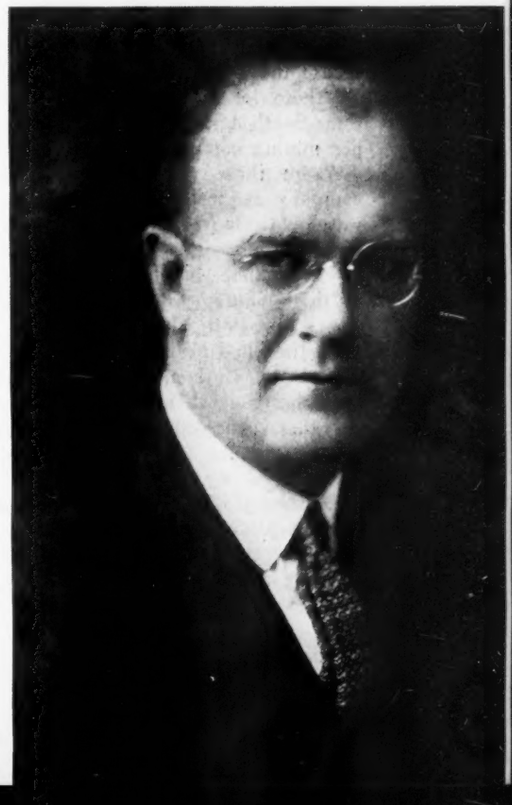
One of the causes for this lack of enthusiasm for anthracite no doubt is the degree of decline of the industry's position. The defeatist attitude within the industry itself, the indifference of the communities dependent upon it and the attitude of mind of the public toward anthracite are hardly sources of inspiration to the younger generation.

Somehow the anthracite industry must face and change this situation. The question is: how? Obviously young men seeking a career are interested in financial rewards. The industry may not have provided them in an adequate degree. But perhaps even more important than that is the opportunity for self-development. Just how such opportunities could be created or how the limitations could be removed is something that cannot be developed in a few sentences. Naturally, also, until the industry commences to show a growing tendency again, such opportunities will be limited.

Young Men Needed

The anthracite industry has been facing and still faces external difficulties which often appear overwhelming. In the measure that this is true the greater must be the effort toward improvement. The future depends largely on the ability of the industry to attract young men; these men need to be encouraged to adopt anthracite as a career and to be educated to meet its problems.

J. B. Warriner



INDUSTRY AND SCHOOLS

Have Joint Job Ahead of Them

Building Men to Take Leadership in Ideas

Talking off the record, educators can grow acid in criticizing coal's indifference to technically trained men. "Most mines don't know how to use an engineer after they hire him" is a common plaint. Mining executives beset with personnel problems have been equally caustic in their comments on how little the schools have really fitted the man for the job. There is something to be said on both sides. Phil Bucky says it here in his analysis of the future of coal-mining education.

By PHILIP B. BUCKY

Associate Professor of Mining
Columbia University

SEVERAL years ago I heard Dr. George Ashley, chief geologist for the Commonwealth of Pennsylvania, give a talk on the "Resources of Pennsylvania." He spoke of its coal, oil, sand, gravel, iron and numerous other minerals. But men, he impressed upon us, were really the most important resource. Without them all these material resources were as useless as they were in the hands of the Indians for centuries before.

The future of any industry can only be as great as the men it attracts, nourishes and holds. Coal is in a race with oil, gas and other fuels and its relative position is largely due to the relative qualities of the men in it. The fight for men has been dramatically called to the attention of the coal people by the fine work of Newell G. Alford. He stressed mainly the efforts of the metallurgical, electrical and automotive industries to secure the best of the younger men. To these let me add the efforts of some South African diamond and copper mining companies.

About three years ago one such company requested some men; two were sent. One is now manager of a diamond mine; the other had his salary more than doubled and returned to this country to serve it in the emergency. Both within the space of a short time had been given the opportunity to make themselves so valuable that the general manager informed me that contractors, foremen and superintendents were clamoring for the services of the returned one.

Contrast this with a coal company offering $125 a month and laborer's work for three to five years before allowing a man to take a mine foreman's examination. In addition the company required the students to take a correspondence course in mining and learn answers to questions which, on the basis of their education, were either so elementary in character or so in error from the standpoint of the present state of science that they could not help but become discouraged, to say the least.

Take a son of Man of War, bring him up carefully in the finest stable and then train him for the Kentucky Derby by having him run around the track pulling a beer truck while teamed up with a Belgian draft horse. You will have a Derby winner or a good draft horse. Maybe! Yet that is what is being done with the best trained and nurtured young men in the coal industry. They are tied up for three to five years with men and work that are not conducive to their growth or progress. This procedure cannot help but drive the good man away or stifle and kill any latent worth that may be in him. As soon as this fact is recognized and changed, just so soon will the industry begin to attract and hold the men it so sorely needs.

The executive of the past has had his complete training in the industry. He is a grand person, able to get along with people, and has been primarily interested in keeping the *status quo* and knowing how things ought to be done. The relative status of the coal, oil and gas industries shows that he has not been successful. He has not yet learned that to keep his relative position in the race he needs not only the above qualifications but ideas as well, and the ability to answer the question "Why?"

When a man comes to him for a position he is interested in knowing how much experience the man has had rather than: (1) does the man know why, and (2) does the man have any ideas which will produce beyond, or at a lower cost, what is being done at present. He does not realize the relative importance of ideas vs. experience, even though he has men still on the business end of a shovel and with 25 years of experience at it.

In talking with executives in the steel, non-ferrous and oil industries I have been struck by the fact that most of them told me that the new technology was over their heads, but they wanted to be put in touch with any outstanding young men who might

develop in these fields and fit into their organizations. Contrast this with the comment so often heard after the presentation of a worth-while technical paper which makes use of new fundamentals of science and mathematics not known to present executives and technical men. "That stuff is no good unless it can be put in words that the foreman can understand." That statement is merely an admission that it is over the critics' heads. But why be afraid to admit it? Why not recognize the fact that most mine foremen understand as much about the radio, the aeroplane, the barodynamics of their roofs and pillars as they do about the thermodynamics of air, even though they do know how to course air?

Must Hunt Out Good Men

College men have no monopoly on brains, vision, ideas and ability. Any young men in an organization who have these qualities should be sought out and encouraged. They should become the personal wards of the executive. Section bosses, foremen and superintendents should have it impressed on them that one of their prime functions is to look out for such men. Frankly, the best educated men I know never saw the inside of a college as students and they are all in mining.

The work of the teacher is primarily one of imparting fundamentals to the student and in addition trying to develop the student's vision and ability to think and develop new ideas. All schools and educators claim that their students are well trained in fundamentals; i.e., the subject material that will enable one to solve any of their problems. But fundamental requirements are constantly increasing.

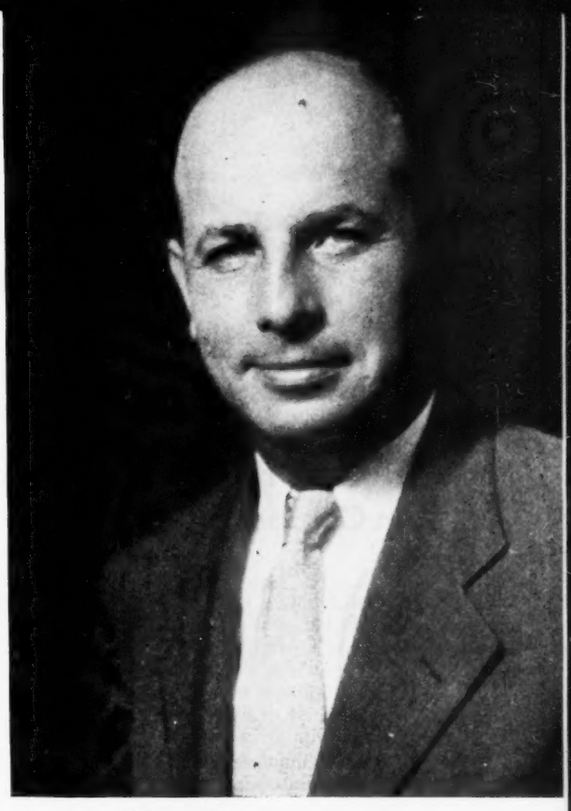
The fundamental requirements of a baby are the ability to yell and to lift a spoon to his mouth. Later he must have the ability to use words; then the knowledge in a book; then, besides many other things, the knowledge as expressed in several books.

At present, or in the near future, a mining engineer will be sadly lacking in fundamentals if he does not have a working knowledge of differential equations, photo-elastics, barodynamics, thyratron tubes, the mathematical principles of finance and the relationship between power, mechanical equipment and men as evidenced by mechanization of today. Our work based on physics and chemistry deals with subjects being continually expanded and revised; textbooks in these fundamentals are obsolete within ten years.

The teacher of mining must keep up with these subjects and contribute to them. If his job is well done, a man teaching ten hours a week will spend from 40 to 50 hours a week in preparation, grading papers and consulting with students. The work is hard, but the bad feature at most mining schools is that the individual has no time to keep up and become acquainted with the new fundamentals, let alone do any research and assume a position of leadership in his subject. Teaching a course which is stagnant (not growing or dead) puts a teacher in the same category and the students in a semi- or fully comatose state. For a teacher to be enthusiastic and thus endow his students with the same virus he must help it grow.

Mining education in America has many serious faults—due mainly to the attempt to give students and industry what they think they both want, without spending the necessary effort to find out what they need. We are like a doctor who really hasn't decided what the patient's disease is, but knows that the patient wants ice cream, while the father thinks sulphur and molasses is necessary. We have mixed sulphur, molasses and ice cream, fed it to the patients and can thank our lucky stars for results so far.

If one looks at college curricula one can see no difference between the course content of most schools. Actually, however, some are trade schools, some a cross between a trade school and a college, and some of university grade. Only by going behind the curriculum and determining the instructors, their pay and outside contacts and quality of publications, can one come to any real conclusions as to the status of the school and the type of education provided. The Society for the Promotion of Engineering Education has done a good thing in providing a means for determining which schools have a minimum set of qualifications. I hope it goes further and continually raises its standards.



Philip B. Bucky

Mining schools, like mining companies, must bend every effort to secure men who can assume positions of leadership in ideas which result in attention and respect and not necessarily in adoration and adulation. The contribution of mining teachers to the advance of the profession should bear a more important part than it has in the past, and the industry should come to the colleges for the solution of their mining problems. To make colleges like that men must be sought, encouraged and rewarded accordingly. Their effect on the young men and the industry is one of the most important fundamental elements in our present-day world.

Fortunately, the industry and its executives are seeking their problems and doing something about them. The men who sold mechanization to the industry not only showed how to produce cheaper fuel but showed also the importance of ideas and gave the industry a new lease on life. The watchword from now on will be change. This change must come from men who can answer the question "why" and therefrom develop a new "how."

NEW LIGHT ON OLD QUESTIONS

How to Bar Down Loose Top Rock In Comparative Safety

For bringing down drawslate, use a straight bar, and never one less than 5½ ft. long. As a handguard, put a short piece of air hose on it at its half length, and stand up to the work in a safe manner, is the counsel of Ralph H. Cleland, assistant secretary, Ontario Mining Association. He advocates, when aluminum is available, use of Duralumin bars because a longer bar is essential than can be easily handled if made of steel. (Duralumin is an alloy containing 93 to 95 per cent aluminum, 3 to 4½ per cent copper, 0.4 to 0.7 per cent each of magnesium and manganese, with 0.3 to 0.6 per cent silicon.)

It is a true saying, declares Mr. Cleland, that "loose never gets tight" and a safe maxim that "if it's loose, take it down or post it up." "Remember," he adds as a closing remark, "loose falls straight down and rolls (or slides) downhill. Stand out of its path." On a pitch, one is likely to regard straight down as at right angles to the pitch, but the roof "does not figure it out that way" and falls dangerously close to the man who is barring it down. A man's head may be under safe roof, but his feet may be in danger from the roof beyond him.

Barring One's Way Forward

"Standing up to the work in a safe manner" includes not leaving any unsafe roof behind one; in short, barring one's way forward. It is important to find out just what area of the roof is covered by the "loose" which the worker is trying to bring to the floor, and then to decide what on the floor it will cover and where it will roll or slide after falling. Care should be taken that rock lying on the floor is not so inclined that the falling rock will be directed onto the man by whom the rock is barred. The barrer must be careful to avoid standing where the rock will fall or where it will slide.

He must be careful to have a firm foothold or he himself may slide or overbalance when barring the roof, thus being injured by falling himself or by having the bar or the rock fall on him. He must assure himself that when the roof yields, he will not pitch forward. Furthermore, the worker must take care lest he be trapped by a post or the rib, which may prevent escape should more rock begin to fall than he has anticipated. Circumspection and good judgment should be expended before attacking any bad piece of roof. Making a place safe is a hazardous occupation, and the men who do it always should be wary.

What Others Say

Discussing this article, W. G. Metzgar, safety engineer, Hudson Coal Co., Scranton, Pa., says: "We use a soft steel bar 6 ft. long and of 1-in. diameter for pulling down rock in our mines. Some years ago, we experimented with an aluminum bar for pulling down rock and found that it bent when pressure was put on it. I do not know if this was the same kind of aluminum as is referred to in the article, but, after trying the one we had, we would not recommend it as a standard bar for pulling down top rock.

"We feel that with a 6-ft. bar there will be no likelihood that a man will stand under the piece of rock he is attempting to bar down. In scaling top rock on pitches we instruct our men to stand up the pitch or to the side of the pitch instead of down the pitch, so that the rock will not slip down or slide down on him after it has struck the floor."

From J. A. Downey, safety engineer, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., comes the advice: "Be sure that the roof over your head is not keyed in, and partly supported by the roof being dislodged." "The suggestion," declares L. M. Evans, inspector, Third Anthracite Inspection District, Scranton, Pa., "to use a lighter bar than the steel one now in common use for barring down drawslate is a good one and should be encouraged. I believe that the unnecessary weight of the bar now in general use and the usual lack of provision of a safe and convenient means to enable a person to 'stand up to the work in a safe manner' have contributed to only too many injuries in the barring of rock and, if these two defects were corrected, the accident toll might be reduced.

"As my experience has been principally in flat seams," declares Mr. Evans, I have many times been compelled to insist that wood horses be provided, where necessary, to enable men barring to stand up to the work in a safe manner. This has been productive of good results. No one can safely and skillfully use his powers to do such heavy work at arms' length with an insecure footing. This fact has prompted many to evade trimming rock promptly and effectively, and the consequence of this delay has often been serious."

The type of bar used in the mines of the 24th Anthracite Inspection District, declares P. J. Friel, State mine inspector, Shamokin, Pa., consists of round steel of 1- to 1⅛-in. diameter and from 4½ to 5½ ft. long. One end is tapered to a thin edge resembling that of a steel chisel, the other end being left blunt for the purpose of testing the roof. Near the center of the bar is welded a metal shield or disk which may be from 4½ to 5½ in. in diameter. This latter stops smaller pieces of materials from sliding down the bar and striking the hands of the user.

"Personally," Mr. Friel remarks, "I would prefer this type of guard to that of a rubber hose. Hard-toed boots are used extensively, but shinguards are not. With these few comments I am in full accord with Mr. Cleland's views on what constitutes a good bar for bringing down roof and with his advice as to precautionary measures to be taken when doing this work."

From Thomas Murphy, superintendent, Northwestern Improvement Co., Roslyn, Wash., comes the comment: "Sealing or barring down loose roof rock is a hazardous undertaking under any kind of mining conditions and, where possible, always should be done by experienced men. In flat seams, it is necessary only to be sure of a safe place to stand when doing the work and not to be caught off balance at the instant the rock falls. In places being driven up pitches exceeding 30 deg., scaling roof becomes a serious problem indeed; the only reasonably safe point for such work is close alongside one or other of the ribs.

Rock That Won't Come Kills

"However," Mr. Murphy adds, "the principal danger to life and limb in the mines is not from the rock that is being pried down, whatever the conditions may be, but from the rock that, after an attempt to pry it down, is left up by the miner because it refuses to fall. Almost any old mine foreman can recall many accidents from roof falls, in which the victim, if still alive, said: "I tried to bar the darned thing down, but it would not fall, so I thought it was safe." The favorite bar in western mines is of ⅞-in. octagon tool steel, about 5 ft. long with a slightly curved chisel point at one end and straight moil or pick point on the other. No hand guards are used on bars here, nor are shinguards used."

Supplementary information from Mr. Cleland states that the scaling bar to which he refers is used by the Phelps Dodge Corporation, Bisbee, Ariz. The handle, he says, is made of ⅞-in. ST 17 Duraluminum (which, according to "Metal Aircraft Construction," is identical with Duralumin). It weighs 0.80 lb. per linear foot and costs in Bisbee 40c. per pound.

The steel spud is about 8 in. long and inserted to a depth of 2½ in. into the ⅞-in. hexagonal seamless steel sleeve and welded thereto. This sleeve is 5-in. long and the Duraluminum bar is inserted in the other end

of the steel sleeve and riveted thereto by a ¼-in. rivet.

With the exception of the letter from Inspector Evans, and perhaps Mr. Metzger, all these letters are from persons engaged where pitching beds predominate. It is interesting to note the variance of practice in regard to the point of the bar—whether curved or straight, whether like a pick point or a chisel—the material of which it is constructed, its length, and the presence, material and size of the guard. It may be said that aluminum, when hardened with copper as alloy, gives a serviceable tool, but already it has been put under priority rules in the United States. In Canada, of course, it cannot be obtained for use as a rock-barring metal. Prompt further comment is invited.

"An accident," said Napoleon "is fate misnamed." As usual, he was in error; an "accident" is rather "somebody's carelessness misdesignated." Somebody failed to sense the dangers that dog the steps of life and adventure, or failed to provide against the hazards thus revealed. Accidents do not happen, they are caused or at least not accorded the requisite preventive action.

•

Keeping Air on the Move At Princeton's Mines

CONSCIENTIOUS and well-advised managements do not employ any equipment without prescribing safe ways of handling it, and auxiliary fans should be no exception. The Princeton Mining Co., at Princeton, Ind., uses auxiliary fans with tubing, and line brattice also in the same heading, so that when the auxiliary fans are stopped or cannot run for any reason, there will be as much ventilation at the face as the unaided main mine fan will afford.

In every instance, the fan is set not less than 25 ft. back from the rib of the last open crosscut and recirculation of the air is further prevented by placing a curtain across the return side of the heading so that the return air from the face cannot possibly go back to the fan. Moreover, the discharge end of the tubing usually is turned over toward the intake rib, so that the air will blow against the rib and not directly toward the face, and thus the draft does not annoy the men at the face, even if the discharge is well advanced, and does not stir up the dust and keep it in suspension. In consequence, the tubing can be placed nearer the face than is usual. As Airdox is used, there is no flying coal to make it necessary to keep the piping at a distance. The air slides along the intake rib and sweeps the face, as it should.

Stop the fan, and there will still be circulation, though it will not be so rapid, for the three fans reduce materially the resistance involved in passing in turn to the six faces by the six intakes, each of which is only 2 ft. wide or a little wider.

In Fig. 2, heading *A* is ventilated by a fan set in heading *B*, 25 ft. back of the last open crosscut, and the air is directed to the face of the latter heading by a line curtain. Headings *C* and *D* are ventilated by a fan located in heading *D*, 25 ft. back of the last open crosscut; air is delivered to heading *E* by a line brattice only with a narrow intake and a wide return, and heading *F* is ventilated by a fan on the intake side of the last open crosscut and 25 ft. back of it.

Where narrow places are driven, the ventilation as shown in Fig. 3 has been used. It is customary at the Kings mine, as a safety measure, to run a row of timbers along the rib of the heading whenever the latter is wider than 14 ft. It serves not only to support the roof but also the ventilating curtain.

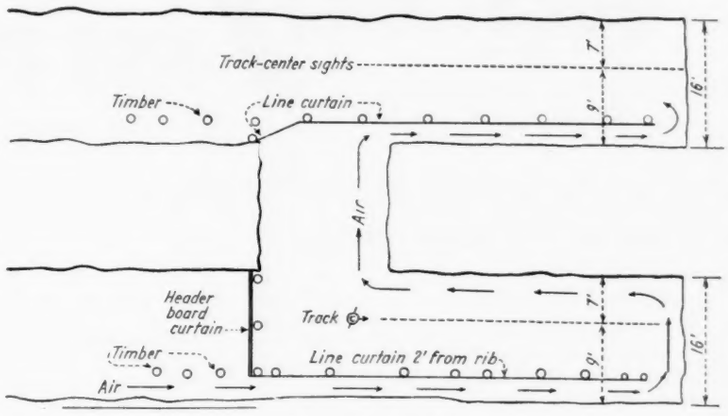


Fig. 1—Ventilation with line brattices only.

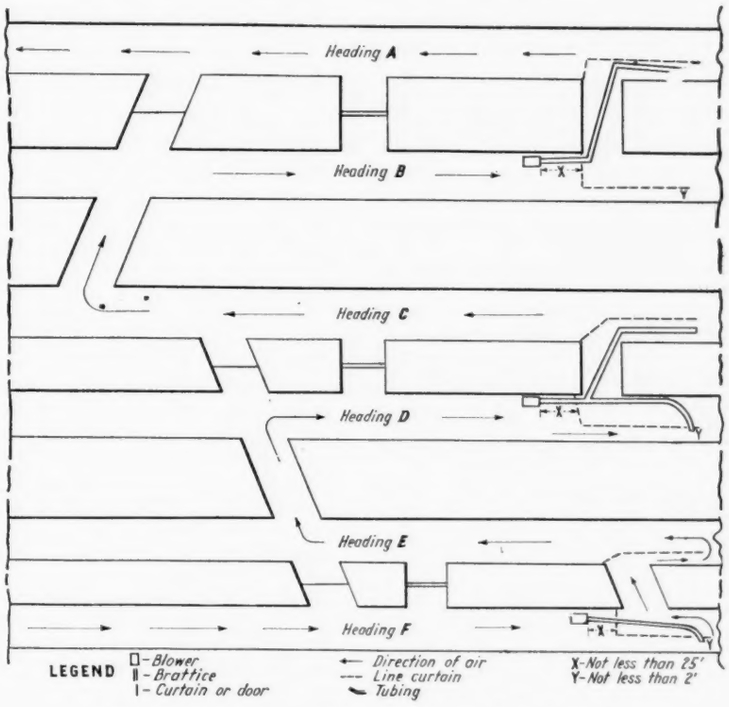


Fig. 2—Method of ventilating with fans and line brattices.

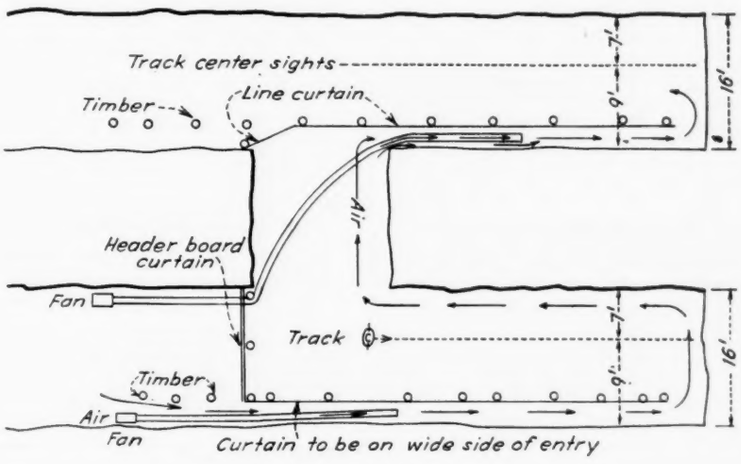


Fig. 3—Another system of ventilation.

QUESTIONS ASKED BY STATE BOARDS

Questions, First Class Mine Managers' Examinations, Illinois, 1940*

Safety Lamp Caps

Q.—How would you examine safety lamps to ascertain their safety in gas? What appearance has the flame of the lamp when brought in contact with various mixtures of an explosive character?

A.—When making an examination of the different types of safety lamps for the purpose of comparing their safety in testing for gas and in general work in the mines, they should be subjected, in such manner that their behavior may be observed with safety, to a current of explosive mixtures of methane and air traveling at different velocities horizontally and inclined in different vertical directions. Experiments of this kind are performed by placing the lamps in a box through which currents of different velocities and having known percentages of gas are passed.

Over the top of the flame caused by the burning of the gases from the oil of the lamp appears a blue flame of a height depending on the percentage of methane. This shows how far the flame is extended by the combustion of that gas. Where much is present, the heat generated causes the cap to extend farther than when less methane is present. The appearance of the flame in contact with various mixtures of methane and air varies according to the kind of flame employed. The two flames generally used in testing for gas are a normal and a small, uniform flame. With the Davy lamp—a lamp, by the way, that the Bureau of Mines declares is unsafe—flame-cap heights are best observed by using the latter type of flame. The heights of the flame caps for different percentages of gas may be calculated roughly by the formula $h = \frac{J^3}{36}$ in which h = height of flame, in inches; J = percentage of methane in mixture; thus, the height of the flame cap in a mixture containing 2 per cent of methane equals $2^3 \div 36 = 0.22$ in., or, for a mixture of 1 of methane to 20 of air (4.762 per cent) $h = \frac{4.762^3}{36} = 3.0$ in.

When Explosion Is Worst

Q.—On what does the force of an explosion depend?

A.—The force of an explosion of methane in air depends on the quantity of accumulated gas and the percentage of methane present. Flame travels at 23 ft. per second in mixtures containing 9.5 to 10 per cent of methane. This is the maximum speed of methane-air explosions; maximum pressure is about 115 lb. per square inch (I.C. 6983). Coal dust, which may be ignited either directly or by a preliminary gas explosion, will create even greater pressures.

If the quantity of methane is excessive, the explosion will not be so violent. If it comprises more than 15 per cent of an atmosphere containing only methane and normal air, the methane will not explode. If opportunity be provided for the gases of combustion to expand, lower pressures will result. In a narrow room or heading, a coal-dust explosion will be more violent than where the opening is wider, and in longwall, violence will be less and the extension of an explosion less certain than in rooms or headings. By causing a diversion of the air, crosscuts in a heading aid in reducing violence, just as would a hole in the side of a cannon.

Dangers of Coal Dust

Q.—What is coal dust? State what dangers arise from shots fired in its presence; also, what would you do to prevent a possible accident due to the presence of coal dust?

A.—Coal dust is coal in a finely powdered condition, the particles of dust often being so fine as to be held readily in suspension by the moving air of the ventilating current. When fine dust has accumulated at the working face or elsewhere, the force of a blast will often raise this dust, which, heated by the flame of the explosion, will distill various gases. These are combustible. Hence they extend the flame of the explosion a considerable distance in the workings, usually igniting bodies of dust or gas remote from the origin of the explosion.

To prevent such an accident, every precaution should be taken to avoid accumulations of dust at the working face; and the roof, floor, and coal of the workings should be sprinkled with water before shots are fired, in all cases where the coal is flammable. An excellent precaution is to spread rock dust in all rooms and headings on ribs, gobs, face and floor.

Causes of Mine Fires

Q.—What are the principal causes of fires in coal mines, and what precautions should be taken to guard against them?

A.—Principal causes of mine fires are: (1) ignition and explosion of a body of gas caused by a naked lamp, the flame of a blast, a defective safety lamp or other light, the sparking of electric wires or motors, or some other source of ignition; (2) ignition of a gas feeder by the flame of a blast or in some other way; (3) spontaneous heating and slow combustion of fine coal in gob or other waste places of the mine; (4) ignition of hay, timber, door frames, or other combustible material by contact with flame of lamp or other ignition source.

Precautions to be taken to guard against such fires are: careful and regular examination of the mine before each shift; examination for gas before firing a blast; ascertainment immediately after firing that no feeder of gas has been ignited; provision of a plentiful supply of air which will sweep the working face free of methane, thus preventing explosions; prompt loading of all fine coal produced at working face, leaving none of it in the gob to mix with waste from roof and floor of seam, for such fine coal is likely to catch fire; sealing of abandoned workings in non-gassy mines with airtight stoppings; use of only lanterns or electric lights in stables and when handling hay.

Ignitions of methane may occur in gassy mines from the sparks caused by the blades of a fan striking the casing and igniting the gas, but this will occur only when the fan is drawing return air. Fires outside the mine may be drawn into the workings by the intake air, and only fireproof buildings should be constructed near any entrance to a mine. Combustible material should not be stored near mine openings nor stables erected near by. This rule applies not only to regular mine approaches but also to openings which are accidentally made in mining by an excessively close approach to the surface.

(The practice of sealing abandoned workings is condemned as dangerous in many States but approved in Illinois. Most mines in that State are deep, but where they are not, care should be taken to prevent outcrop workings from being filled with refuse which may be set on fire by careless persons or by brush fires. Children also and grown persons may trespass on outcrop holes and set fire to the coal.)

Ventilation

Q.—Cross section of an airway is 6x10 ft. and its length is 5,000 ft. Assuming coefficient of friction, k = 0.00000002, what pressure will be required to pass, through this airway, 60,000 cu.ft. of air per minute?

A.—The area a is 6x10 = 60 sq.ft.; the rubbing surface is length x perimeter of airway = 5,000x2(6+10) = 160,000 sq.ft. The velocity in feet per minute will be the quantity of air in cubic feet per minute divided by the area in square feet = 60,000 ÷ 60 = 1,000 ft. per minute.

Then applying the formula for pressure: $p = ksv^2 \div a = 0.00000002 \times 160{,}000 \times 1000^2 \div 60 = 53\frac{1}{3}$ lb. per square foot = 10.6 in. water gage. The speed of this air current is excessive for any such distance

* Continued from March, p. 70.

as 5,000 ft. W. J. Montgomery recommends that such a speed should not be allowed, for purposes of economy, to extend for more than 1,000 to 2,000 ft.

Q.—The main heading in a mine is 7 ft. high 10 ft. wide, and 6,720 ft. long; what is the velocity of the ventilating current passing through this heading if the water gage is 2 in.?

A.—The pressure in this case is 2 in. x 5.2 = 10.4 lb. per square foot; $ksv^2 \div a = p = 10.4$; $v^2 = a \times 10.4 \div ks$; $a = 7 \times 10$; $k = 0.00000002$ and $s = 2\ (7 + 10) \times 6{,}720 = 228{,}480$; $ks = 0.0045696$; $v^2 = 70 \times 10.4 \div 0.0015696 = 159{,}314$; $v = 399.14$ ft. per minute = required velocity.

Q.—An airway has three sides, 6, 8 and 10 ft., respectively, and is 900 yd. long; what is the area, perimeter, and rubbing surface? What quantity of air will be passing in this airway with a velocity of 425 ft. per minute?

A.—The cross-sectional area of this airway is found by the following rule: From one-half the perimeter of the airway subtract each side separately; multiply together the three remainders thus found and the half perimeter, and extract the square root of the product; the result is the area required. Or, expressed as a formula, representing the length of three sides, as *a*, *b*, and *c*, and the length of the perimeter as *S*.

$$\text{Area} = \sqrt{\tfrac{1}{2}S\ (\tfrac{1}{2}S-a)\ (\tfrac{1}{2}S-b)\ (\tfrac{1}{2}S-c)} = \sqrt{12\ \ (12-6)\ \ (12-8)\ \ (12-10)} = \sqrt{576} = 24 \text{ sq. ft.}$$

perimeter = 6 + 8 + 10 = 24 ft.; rubbing surface = 24 × 900 × 3 = 64,800 sq.ft.; quantity of air passing when velocity is 425 ft. per minute = 425 × 24 = 10,200 sq.ft.

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Chief Mine Electricians' Examination Pennsylvania, 1940

(Experience, 20 per cent. Applicants must make a grade of 70 per cent to qualify. Full credit shall be given only to those candidates who are now employed as mine electricians or those who have had extensive experience in that capacity.)

Q.—(a) What are the duties of the mine electrician? (b) Explain the term "short circuit." (c) Explain what causes high-resistance electrical arcs. What determines whether a d.c. system is effectively grounded? (d) How would you ascertain whether the grounding method and system are defective?

A.—(a) It shall be the duty of the mine electrician to assist the mine foreman to comply with all the provisions of the bituminous mining laws bearing on the use and installation of electricity in bituminous coal mines, and the equipment powered thereby, and he shall be subject to the same penalties as the mine foreman for any violations of these laws. (2 per cent.)

(b) Electricity, like water, follows the lines of least resistance; therefore, when two parallel conductors of different polarity are accidentally, or otherwise, crossed, as when the positive trolley line comes in contact with the negative rail, a shorter path is offered by which the electric current can, and does, complete the circuit; thus originated the term "short circuits." (1 per cent.)

(c) When an energized positive conductor is brought in contact with a negative conductor, either accidentally or otherwise, and instantly withdrawn to a fixed distance, consistent with the line voltage, an electric arc is formed. The high resistance offered by the air gap so made is such as to reduce the amperage to a point considerably below the rated capacity of the fuse or circuit breaker; therefore, the arc will be sustained until, by fusion of the conductors, the length of the air gap becomes too great for the line voltage to span it; thus the arc finally snaps out; hence this is known as a "high-resistance arc." (1 per cent.)

(d) A d.c. coal-mine system of grounding is effective when (1) grounding wires are adequately protected against damage from falls of rock or coal, derailed cars or other causes of rupture; (2) these wires are of a current-carrying capacity sufficient to insure that the path will continue to be effective when an accidental grounding of any normally ungrounded conductor causes an excess flow of current; and (3) when such wires are effectively connected to the return rail. (1 per cent.)

(e) Defects in the grounding system may be determined by ascertaining the current-carrying capacity of the grounding wires, by observation of the means provided for their protection against damage and by inspection of the connections. If any or all these conditions are found substandard, the system and method will be ineffective. (2 per cent.)

Q.—(a) What is meant by "power factor" in a.c. systems? (b) When and where are ground detectors used? (c) What is the purpose of ground detectors in electrical systems completely insulated from earth? (d) What is the standard frequency and phase used for power in the bituminous mines of Pennsylvania?

A.—(a) The so-called "power factor" is the cosine of the angle by which the current lags behind the voltage, or the difference between true watts and apparent watts. (2½ per cent.) (b) Ground detectors are used when a.c. underground systems of distribution are completely insulated from earth and when they can be placed at a convenient location where workmen can see them without difficulty. (½ per cent.) (c) Ground detectors are employed to indicate leakage from system to earth before an accident occurs. (½ per cent.) (d) The usual frequency is 60 cycles per second and the current is 3-phase. (½ per cent.)

Q.—(a) What is a kilowatt? (b) How many watts are equal to one horsepower? (c) A d.c. motor is operating at a pressure of 250 volts and the ammeter shows a consumption of 100 amperes. What is the horsepower consumed?

A.—(a) One kilowatt is 1,000 watts. (½ per cent.) (b) One horsepower is equal to 746 watts. (½ per cent.) (c) Horsepower consumed = volts × amperes ÷ 746 = 250 × 100 ÷ 746 = 33.51 hp. (2 per cent.)

Storage-Battery Locomotives

Q.—(a) Under what conditions are storage-battery locomotives permitted to operate in gassy parts of a mine? (b) What dangers are incident to the recharging of the storage batteries of a mine locomotive? (c) What safeguards are necessary to minimize such dangers?

A.—(a) Storage-battery locomotives are permitted to be used in gassy parts of mines only when all electrical parts that practicably can be inclosed are located in flame- and explosion-proof casings. (2 per cent.)

(b) Dangers incident to recharging of storage batteries are fires, explosions, burns, poisonous acid and electric shocks. (2 per cent.)

(c) Storage-battery charging stations located underground shall be constructed of incombustible materials, and all such materials as are combustible must not be stored therein. To prevent explosions, the gases liberated from electrolytes during recharging shall be diluted and rendered harmless by adequate ventilation. Before recharging, the top covers of the locomotive and the battery-cell caps shall be removed to prevent excess gas accumulations within the cells and under the covers.

Extreme precautions should be taken when handling both cells and electrolyte to prevent acid burns. The rails upon which the locomotive rests during the charging period shall be insulated from the underground trolley system, and the same precaution against shock shall be taken as when handling medium-voltage equipment. Dust accumulations shall be removed from battery tops daily. (2 per cent.)

Inspection and Repair

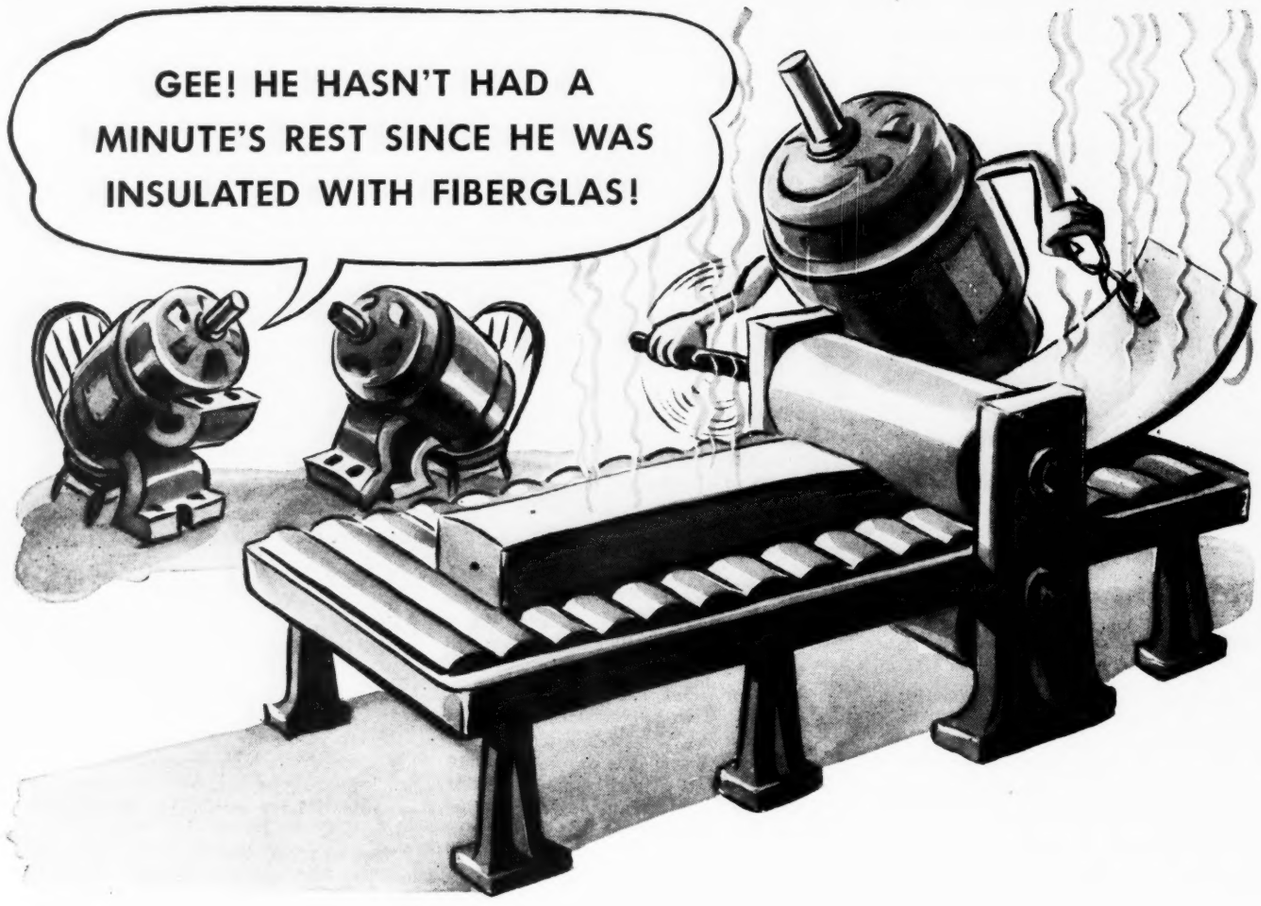
Q.—(a) How often should explosion-proof motors and switches be opened, thoroughly cleaned and inspected? (b) Who is required to do this work?

A.—(a) All inclosed motors used underground shall be opened and thoroughly inspected at least once a week and, where necessary, they shall be cleaned and repaired. Inclosed switches shall be opened and inspected at least once a month. (½ per cent.) (b) The person in charge of electrical equipment or his assistant shall open, clean and inspect this equipment. (½ per cent.)

Q.—What examinations would you make before attempting to repair a mining machine at the working face of a gassy portion of a mine?

A.—Open the mining-machine switches, disconnecting the power from the machine, and protect it against the possibility that cable nips and return will conduct stray currents thereto. Examine the working face with a flame safety lamp to ascertain whether gas is present and also examine roof, coal and ribs of such place for danger before attempting to repair the machine. (3 per cent.)

(To be continued)



Fiberglas* Insulation cut losses from downtime on the toughest jobs

LAST YEAR a certain Midwestern steel plant changed over to Fiberglas for electrical insulation.

Result: $24,000 saved on maintenance (according to the company's own figures).

In addition, *they had less downtime* on equipment that worked in moisture...

. . . in scorching heat, dust, flying scale-particles from the rolling mills . . . over pickling baths where corrosive acid fumes surround the motors . . . and on cranes where many stops and starts cause serious overloads.

What's more, the company made that $24,000 saving even though they had *more* equipment running *more* hours than the previous year!

Wherever you have tough jobs to do, Fiberglas may well do them better, with fewer headaches, and at less cost.

Perhaps you don't have motors working under tough conditions. Perhaps the surroundings in which your motors work are entirely normal.

Then so what?

Is it possible for Fiberglas-insulated motors to help you?

Yes! *And in a very important way!*

Today, industry is gearing up for defense production. 24-hour schedules are becoming more and more common. And as machinery operates more hours per day and at greater speeds, *the hazard of downtime mounts.*

You need an additional safety factor in your motors. And you can get the maximum safety factor in standard-size Fiberglas-insulated motors.

Also, today important motor manufacturers are making smaller-size Fiberglas-insulated motors which operate safely at approved higher temperatures.

And the pay-off?

Even these smaller motors have a substantially larger safety factor than ordinary motors insulated with class A materials. And their cost is little, if any, more.

So, with the expensive bugaboo of downtime looming larger on the industrial horizon, watch out! In new equipment or in your next repair job, specify complete Fiberglas Electrical Insulation. *Owens-Corning Fiberglas Corporation, Toledo, O. In Canada: Fiberglas Canada, Ltd., Oshawa, Ont.*

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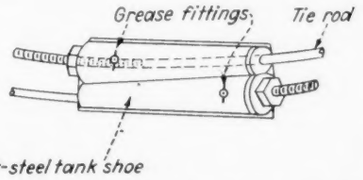
WHAT'S NEW IN OPERATING IDEAS

Grease Fittings on the Shoes Keep Tie-Rod Threads Free

In rebuilding three wood-stave water and settling tanks recently, writes K. N. Banthin, mining engineer, Oak Park, Ill., it was found impossible to move the nuts on the tierods at the connecting shoes. The outside threads had been painted fairly well, which permitted some of the nuts to be backed off, but nearly all the interior threads had corroded and rusted to such an extent that they could not be cleaned up with a die. This necessitated having the blacksmith weld new threaded ends on the old rods.

"To prevent a recurrence of this condition and also permit the proper taking up of the new tanks, a permanent inner-thread greasing system was installed. As shown in



Showing fittings applied to shoes to permit greasing.

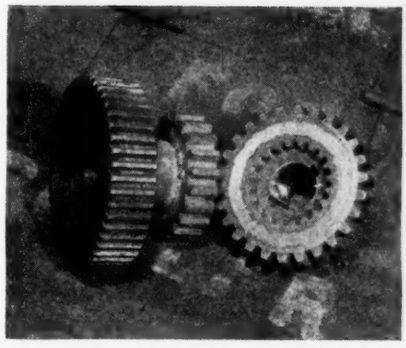
the accompanying sketch, each shoe was drilled with a ⅜-in. hole just over the tierod and about 1 in. from the end of the shoe. These holes were threaded with a tap. Into them were inserted regular pressure-type Alemite fittings.

"At each tightening-up period since the tanks were rebuilt a grease gun has been placed on these fittings and the entire interior of each casting filled with grease until it came out past the rod at each end. A heavy fiber grease is being used and is expected to stay in the castings even through the summer heat. This method has kept the nuts free and the threads in good condition for the six months they have been installed."

•

Rings and Teeth Welded On In Reclaiming Gears

Certain gears and pinions in the forward and reverse transmission cases of Joy loading machines at Kings mine, Princeton Mining Co., Princeton, Ind., notably 10BU and 11BU units, are reclaimed with substantial savings by welding on new rings complete with teeth. The back gear and pinion and sliding gear are among those so reclaimed. Replacement rings, complete with teeth, are supplied by the Tool Steel Gear & Pinion Co., which bevels the inner face to facilitate welding.



Showing new rings welded on sliding gear and back-gear pinion.

When the teeth on the original gears or pinions become worn or broken, they are removed in a lathe and the unit is turned down to accommodate the new ring, including beveling to correspond with that on the ring. The ring then is slipped on and welded in place. Cost of the new ring, plus installation labor and cost of rod, is substantially less than the cost of a complete new gear or pinion. Where necessary, the weld is faced in a lathe after it is made.

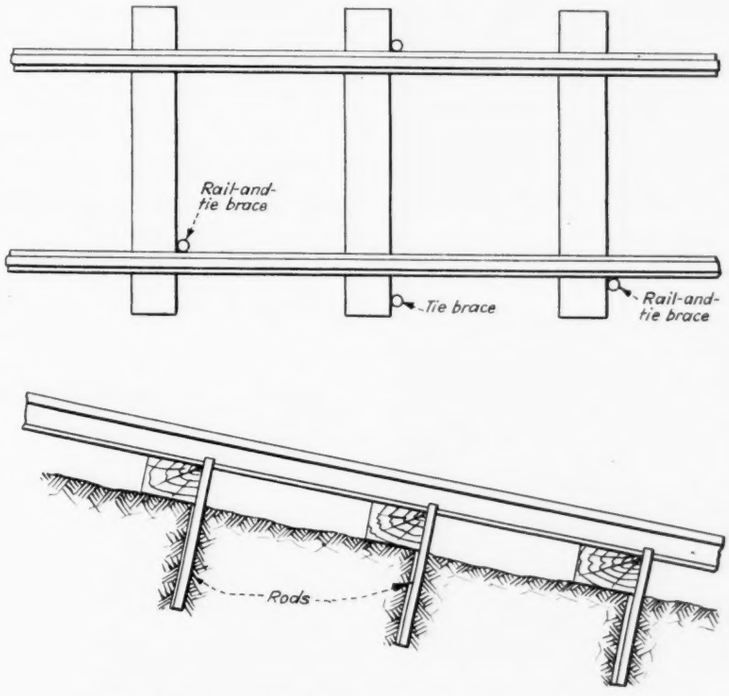
Kings mine also has adopted the plan of locking all transmissions to that movement is in low gear at all times. Since moves normally are short, a higher tramming speed in this part of the cycle makes no appreciable difference, while the strain on gears, motor and the like is materially reduced.

•

Rods in Holes in Bottom Anchor Mine Track

Cheapness and ease of installation are claimed for the method of anchoring mine track shown in the accompanying illustration, submitted by Charles W. Watkins, Kingston, Pa. The anchors are made of rods set in holes in the mine bottom. These holes may be made with the standard air or electric drilling equipment. Depth will vary with the nature of the bottom rock. The anchor rods should be about ⅛ in. smaller than the holes so that they can be removed easily for use in another place when the time comes. Ordinarily, the rods project just enough to come up to the tops of the ties or just far enough up to engage the base of the rail.

Where rope haulage is used, the rods should be installed so that rubbing by the rope will not take place. Also, anchoring



Showing diagrammatically the use of rods for anchoring track.

in this fashion should not be done close enough to shaft so that there is a possibility of the rock being cracked to the shaft walls as a result of shocks from stopping cars. In the neighborhood of shafts, also, holes should be deeper as an added safeguard. This method of anchoring, says Mr. Watkins, has been used with a number of installations of his patented automatic car stop, as well as on slopes, inclines and the like.

•

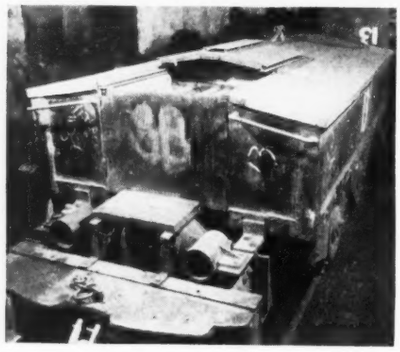
Mine Feeder Lines Welded For Better Service

"In splicing feeder lines in the mine," writes H. W. McDowell, superintendent, Somers Coal Co., Adena, Ohio, "we weld the wire with phosphate-copper acetylene-welding rod, thus making a better splice with a lower resistance and a higher tensile strength than when using ordinary wire splicers. This also saves the price of the splicers."

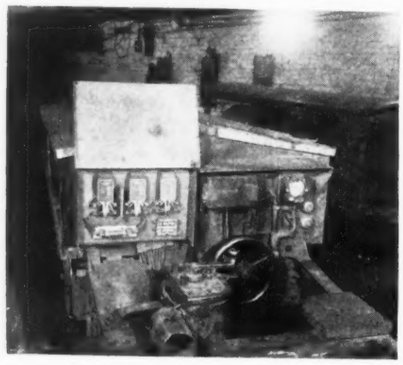
•

Charging Equipment Installed On Battery Locomotives

A number of battery locomotives are in service in both car-changing and extra work at Kings mine, Princeton Mining Co., Princeton, Ind. Since these locomotives are busy most of the day, charging at regular stations took them out of service for too long a time, unless extra batteries were purchased. Consequently, the problem was solved by placing the charging equipment and controls on the locomotives themselves, as shown in the accompanying illustrations.



Showing charging resistor on one end of battery locomotive. The cover has been slid back to show the grids.



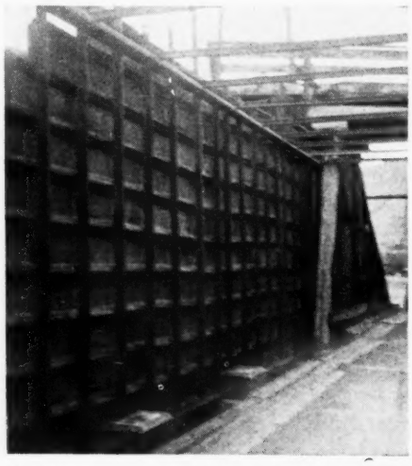
Charging controls are placed in a cabinet on the cab end of the locomotive.

Charging current is supplied by a Post-Glover resistor, usually on one end of the locomotive. Sangamo charging controls, with high and low switches, etc., are mounted on the cab end. Thus, charging can be done anywhere by placing a nip on the trolley wire.

•

Discarded Shaker Chutes Keep Old Underpass Intact

Ultimately, shaker chutes get beyond repair and then can be used as lagging below or above ground. At Olyphant colliery of the Hudson Coal Co. two wood cribs protected an underpass through a fill on which tracks had been laid. In time, these became rotten, so, old 40-lb. steel rails were set in post holes 4 ft. deep at intervals along the faces of the cribs and were driven by hand 2 ft. deeper.



Uprights lagged with discarded shaker chutes will keep this underpass open — under construction.

These, further, were kept in place by two discarded 90-lb. rails running laterally near the surface of the ground and by two lines of discarded 40-lb. rails, also running laterally along the tops of the vertical rails. These traverse rails were welded to the uprights and to cross rails joining this skeleton construction on either side of the underpass, which was closely lagged by cut-off sections of discarded shaker chutes. These for a long time will keep the fill in place and give protection to the underpass.

•

Smoking Mandrel With Torch Frees It From Babbitt

Chalk or carbon commonly are applied to mandrels in pouring babbitt bearings so that the mandrel will slip out easily after the babbitt has cooled. This is particularly essential with the high-speed type, points out James H. Arnott, master mechanic, Crested Butte (Colo.) mine, Colorado Fuel & Iron Corporation, who finds smoking the mandrel with the acetylene flame from a regular cutting torch the most convenient method. Since the mandrel comes out easily without sticking, the inside surface of the bearing is left without scoring or other defects which might render it unfit for further boring or other processing.

Le Printemps

Springtime, in whatever language, means housecleaning and a new slant on life, not to mention spring fever. So now, we take leave to suggest, is the time to look over your kinks for saving time, cutting costs or promoting safety. Look them over and send them in to Coal Age so we can pass the word along. All operating, electrical, mechanical and safety men are included in this invitation, and each acceptable idea will bring its author at least $5 when it is published in Coal Age. So let your slogan be "Do it now!"

Automatic Man-Trip Drag Held Up by Rope

An automatic drag which is held in the air by the rope until the time for use is employed at the Keystone mine of the Keystone Coal Co., Routt, Colo. Developed by Leo Coan, until recently chief electrician, the drag and auxiliaries are mounted on a special car which is used behind man-trips when they are hoisted out of the slope. If the grade is steep enough so that no slack occurs in the rope, the drag may also be used for lowering man-trips.

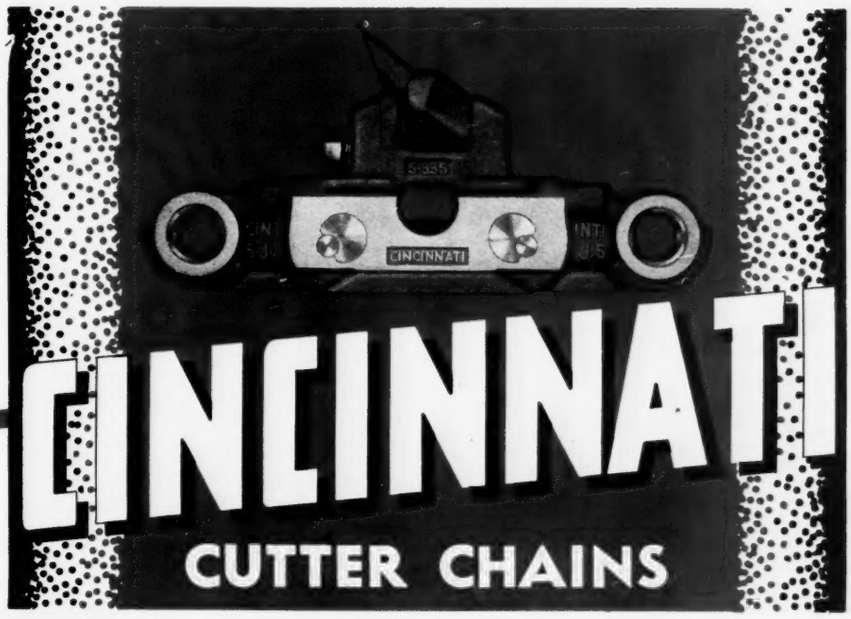
The special car, as shown in the accompanying illustrations, is partly filled with

Front end of the drag car, showing rope coming out of pipe.

Mr. Coan shows chain and weight used to hold auxiliary drags off the track. The big drag also is locked up in inoperative position.

FEATURED • • •

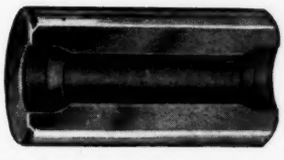
. . . at the
CINCINNATI MINE SHOW
BOOTHS
215 and 217



IDEAL PARTNERS *for* YOUR NEW HIGH-PRODUCTION COAL CUTTING MACHINES

Modern high-production cutting machines base much of their capacity on the chain they utilize . . . and you'll find it pays to use CINCINNATI CUTTER CHAINS on all your cutters. For, regardless of strain and stress of long production schedules, CINCINNATI stands up and does a superior job. This ability to deliver is due in part to superior materials and manufacture and in part to specialized design. Then, too, consider this important feature. It's the joint that bears the brunt of the wear, and here's where CINCINNATI excels . . . when the joint eventually becomes worn, and the chain loses its pitch, replace the joint, it's inexpensive *and the pitch of the chain is perfect again*. So, make your cutting operations the lowest cost-per-ton item in your mining budget by choosing CINCINNATI CHAINS. When you're in Cincinnati drop by our booth . . . or better yet, call at our plant and see how our chains are made. If you're not attending the show, write to us and we'll send complete details.

BE SURE TO INSPECT THIS JOINT ASSEMBLY



The bearing is rigidly locked in the block by the flat on one side.

This easily replaceable rivet holds the bearing pin against longitudinal displacement.

The connector insert, when placed in service with the rivet and bearing pin, completely renews the chain joint.

Indicating how main drag looks when dropped to the track. Note rope coming out of pipe.

ballast to keep it from tipping or riding off the track in case the drag operates. A pipe through the car from the front end to the drag in the back accommodates a short length of rope, which serves to couple the drag car to the rest of the trip. At the back end, the rope is clamped on top of the drag. Thus, when the trip starts up and tightens the rope, the drag is lifted into the air where it cannot strike rope rollers or wear the ties. If the hoist rope or a coupling pin or link parts, the rope in the drag car slacks off and lets the drag drop to the track, stopping the trip. As previously stated, if the slope is steep enough so that the trip always is stretched out, the drag may be used in exactly the same way in lowering men.

When not in use, such as when lowering trips where flat or slightly inclined sections occur, the drag may be held up off the track by means of a pin passing through beneath it and locked in place by a second pin. Two auxiliary drags made of bar steel are used on the Keystone car. These pass on each side of the rope rollers. To eliminate fiddling with hooks or similar fastening devices, Mr. Coan devised a chain and weight, which needs only to be thrown around the bars, with the weight inside the car, to hold them up off the track.

•

Clutch Installation Eased By Special Lifters

Replacing the front clutch on a Joy loading machine ordinarily is a difficult job, due to lack of working space. To ease this task, Ray Rodgers, third-shift chief electrician at the Kings mine, Princeton Mining Co., Princeton, Ind., hit upon the lifting handles shown in the accompanying illustration. These lifters consist of pieces of pipe with sockets welded on one end. These sockets fit over the ends of the clutch shaft and, in addition to making it easy to lift the clutch, also protect the threads. The lifters are long enough so that a man can stand alongside the head on each side.

Showing how clutch lifters are used.

•

Trolley Limits Barge Drift At Tipple on Kanawha

Instead of the usual long rope anchored at each end to the shore and suspended parallel to the shore line, a rigid track rail facilitates control of barges at the Kanawha River tipple of Cedar Grove Collieries, Inc., Cedar Grove, W. Va. Barge-holding lines are attached to trolleys which are free to travel along the rail.

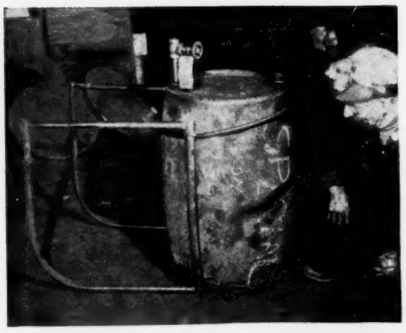
Drifting out from shore is prevented by a rope from coal barge to rail trolley.

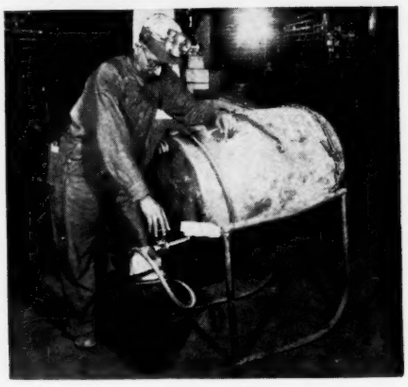
The accompanying illustration is a view from the lower end of a barge being loaded at the river tipple. The steel rope from barge to trolley keeps the end of the barge from drifting away from shore. By this method it is kept at a constant distance without changing the line. If a wire rope were used in place of a rail, the stretch and the bow at the center would entail considerable labor for line adjustment to maintain close control. Barge movement up and down the river is controlled by an electric hoist in the river tipple.

•

Tilting Rack for Barrels Eases Handling

To ease the handling of oil and other barrels at Kings mine of the Princeton Mining Co., Princeton, Ind., the tilting rack shown in the accompanying illustrations is employed. This rack makes it easy to place a barrel in pouring position with sufficient height for filling smaller containers. As can be seen in the illustration, the rack is made of pipe with rounded corners at one end on the bottom.





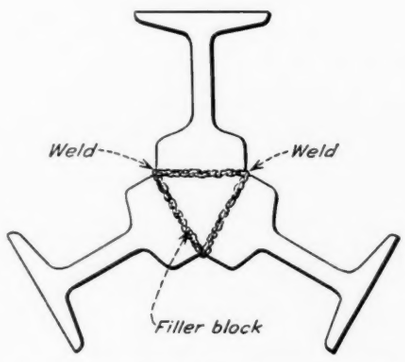
Showing rack being applied to barrel and (below) barrel in pouring position.

In handling a barrel, the pipe loop on the rack is dropped over one end and the chain locked around the other. Rack and barrel then are tilted forward to bring them into the right position for pouring.

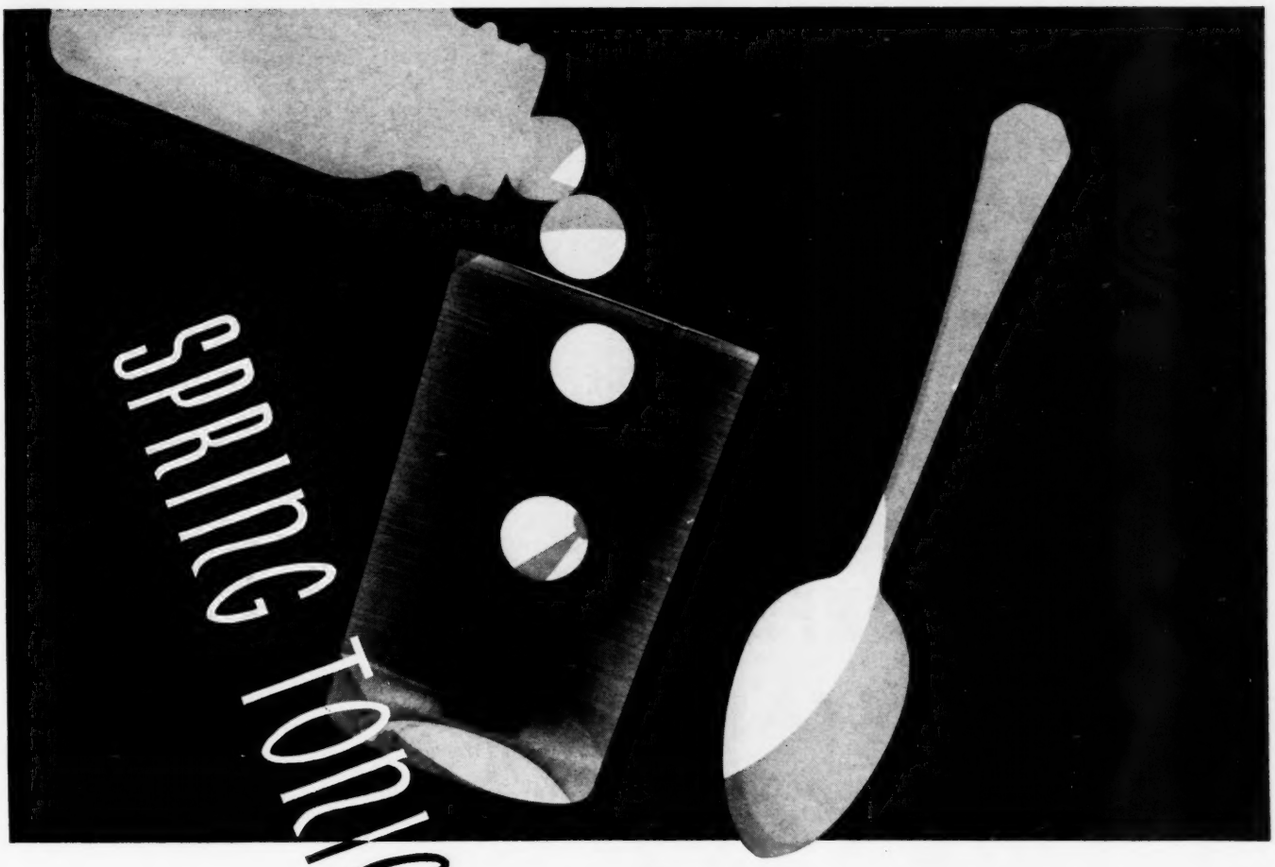
•

Three Rails Welded Together Make Steel Timber Legs

Where the regular steel H or other shapes are difficult to get, P. C. Ziemke, Milwaukee, Wis., suggests that steel legs for mine use may be made by welding old rails together as shown in the accompanying illustration. The rails are assembled on triangular filler plates, which are cut to the correct size and are used in closing the openings at the ends of the completed legs. The filler plates also serve to hold the rail lengths in place for welding along the lines of contact between the balls, and furnish a larger, smooth bearing surface



Showing how the rails are placed ball to ball for welding to make legs, using a triangular filler block at either end.



... for Coal Operators

Increased tonnage with larger net profits is always a tonic worth administering. Here's our prescription:

Check over your tipple and equipment . . . see where needed repairs will quicken certain handling operations . . . where new screens will speed up sizing . . . investigate the possibilities of installing a low-cost but efficient Morrow cleaning unit.

This Spring and Summer we can change your entire production picture, install the equipment you need and enable you to quote profitably on any of your customer's coal requirements. Better yet . . . there's only one responsibility . . . one negotiation. Why not let a Morrow Engineer make this tipple inspection with you?

MORROW

MANUFACTURING CO. WELLSTON, OHIO

DESIGNERS AND BUILDERS OF COAL HANDLING EQUIPMENT FOR OVER 25 YEARS

Shaking Screens

Coal Washers

Car Hauls, Picking Tables

Loading Booms, Loading Chutes

Bins, Bin Gates

COMPLETE COAL TIPPLES AND COAL HANDLING EQUIPMENT

Elevating and Conveying Machinery

Sand and Gravel Screening and Washing Machinery

Car Retarders

Settling Tank, Grizzlies

Revolving Screens

Perforated Metal Screens

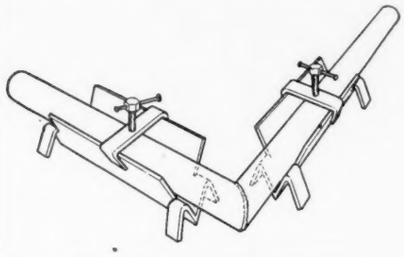
Flanged Lip Screen Plates

at either end. They also prevent the entrance of water, which might corrode the rails from the inside. "The rail posts present a good appearance when installed and have but two additional edges, as compared to H or I sections."

•

Light-Weight V Supports Useful in Shop Work

Practicality and usefulness are cited for the light-weight V-type work supports shown in the accompanying illustration. These supports, says Charles H. Willey, Penacook, N. H., come in handy for assembly work or at the welding bench, drill press, etc.



Details of V-type work supports.

Construction details are shown in the sketch, including the method of sawing the ends of the angles and bending them down to make supporting feet. The clamps are made of bar stock and slide along on the sides of the Vees.

•

High-Voltage Cables Suspended In Loops Made of Old Belt

Cables for the transmission of 2,300-volt a.c. power underground at Kings mine, Princeton Mining Co., Princeton, Ind., are suspended from the roof in hangers made by splitting old conveyor belt. For added security, a standard porcelain hanger usually is put up at intervals. The belt hangers were figured out by George Lane, night electrician, and naturally are distinguished by a low cost. They are put up with an ordinary expansion bolt, plus a nut and washer. A major advantage, it has been found, is that in case of a fall the hangers rip apart and the cable drops to the bottom without breakage or tearing of the insulation.

Showing cable hangers made of old conveyor belt.

WHAT'S NEW IN THE FIELD

Federal Mine Inspecton Bill Approved By Senate; N.C.A. Protests

THE federal mine inspection bill, H. R. 2082, was approved without debate by the Senate at Washington on March 27. The measure, which provides for inspection of coal mines, in cooperation with State bureaus of mine inspection, authorizes the U. S. Bureau of Mines, through its representatives, to make such inspections and publicize its findings and recommendations.

The Mines and Mining Committee of the upper house amended the measure in one important particular by inserting the following provision: "That in the selection of persons for appointment as coal-mine inspectors any inspector employed shall be *a person with a basic qualification of five years' practical experience in the mining of coal.*" The foregoing takes the place of the following: "That in the selection of persons for appointment as coal-mine inspectors any inspector employed shall be an accredited mining engineer or the equivalent thereto with the basic qualification of five years' practical experience in the mining of coal."

As passed by the House on March 13, without record vote, certain parts of Sec. 2 had been removed, making that section read: "Sec. 2. The Secretary of the Interior, acting through the United States Bureau of Mines, is further authorized and empowered to make or cause to be made the inspections and investigations provided for in Sec. 1 of this act at other than annual intervals at any time in his discretion when the making of such inspections or investigations in the mine concerned will be in furtherance of the purposes of this act."

Misrepresentations, false charges and half-truths were imputed by the National Coal Association to proponents of the bill in the report of the House Committee on Mines and Mining presented on Feb. 28. These imputations are contained in a statement issued the same day by John D. Battle, executive secretary of N.C.A., as follows:

"The misrepresentations and false charges indulged in by proponents of the compulsory federal mine inspection bill since its first appearance in Congress nearly two years ago are carried over into the report which the Committee on Mines and Mining made to the House today in support of the committee's approval of a revised version of H. R. 2082, by Representative Flannery of Pennsylvania, one of the several coal-mine inspection bills which have been introduced in the present Congress.

"Neither the bill reported by the committee nor the bill that was the subject of lengthy committee hearings in the previous Congress contains any media for accident prevention and safety except additional and multifarious inspections by federal agents and attendant publicity, and there is not a particle of evidence that such additional inspections standing alone will save a single human life, and yet Congress is asked to enact the bill with the false pretense that it provides a mechanism for preventing accidents.

"Today's report asserts in one paragraph that under existing law the jurisdiction of the U. S. Bureau of Mines is severely limited, and asserts in the succeeding paragraph that the extension of the authority of the Bureau contemplated by the bill is no usurpation of state authority. The record of the hearings before the committee contains abundant contradiction of both of those assertions.

"The committee report contains the assertion that the federal inspectors lack authority to enter underground workings without the specific permission of the mine owner. This is a half-truth. The whole truth is that Bureau inspectors are freely welcomed and often invited. No obstacle stands in their way.

"The committee report asserts that the Bureau is without authority to publicize its findings or recommendations. This is wholly untrue, as is evidenced by the voluminous reports, widely publicized by the Bureau, of its investigation of every recent mine disaster. No one has challenged the authority of the Bureau to publicize its findings and its recommendations. Secretary Ickes is on record to the effect that the Bureau has ample authority so to do. These public reports are in the files of the House committee.

"It is an amazing effrontery that on this state of facts the committee report to the House today reiterated the false statement that one of the reasons why the present bill is needed is to give the Bureau of Mines the authority to publish reports of its inspections and to publish its recommendations.

"One new false representation makes its appearance in the report of the House committee. It is the insinuation that anthracosis, silicosis, and occupational pneumonia are widely prevalent within the coal industry, and the assertion that these conditions stem to lack of uniform supervision.

"The record does not sustain either of these contentions. Occupational disease in the coal industry is a disputatious question, into which the committee inquired hardly at all, and there is not an iota of evidence in the record before the committee that there is the slightest connection between occupational diseases, if any there be in the mining of bituminous coal, and a lack of uniform supervision.

"The basic objections to compulsory mine-inspection legislation of the character contemplated by the present bill have been repeatedly expounded. The willingness of the coal producers to continue to cooperate in the future as in the past with the federal Bureau of Mines has been repeatedly affirmed. The advocacy by the industry of increased appropriations for the Bureau of Mines in order that it may do a greater service in its field is a matter of public record. But the misstatements and half-truths contained in the report submitted to the House today cannot be allowed to pass unchallenged."

Coming Meetings

- Anthracite Section, American Institute of Mining and Metallurgical Engineers: spring meeting, April 18, Pottsville, Pa.
- American Mining Congress: 18th annual coal-mining convention and exposition, April 28 to May 2, Music Hall, Cincinnati, Ohio.
- Fourth Annual Anthracite Conference: May 8 and 9, Lehigh University, Bethlehem, Pa.
- Northern West Virginia Coal Association: annual meeting, May 13, Fairmont, W. Va.
- Sixth Short Course in Coal Utilization: University of Illinois, Urbana, May 21-23.
- Stoker Manufacturers' Association: annual meeting, May 26 and 27, White Sulphur Springs, W. Va.
- Mine Inspectors' Institute: annual meeting, June 2-4, Bluefield, W. Va.
- Illinois Mining Institute: 23d annual boat trip and summer meeting, aboard Str. "Golden Eagle," leaving St. Louis June 6 and returning June 8.
- Mining Society of Nova Scotia: annual meeting June 24 and 25, Pictou Lodge, Pictou, N. S., Canada.
- Rocky Mountain Coal Mining Institute: annual meeting, June 26-28, Cosmopolitan Hotel, Denver, Colo.

Anthracite Conference Provides Varied Program

A diversified program is to be provided for the Fourth Annual Anthracite Conference, to be held May 8 and 9 at Lehigh University, Bethlehem, Pa. According to Chairman Howard E. Eckfeldt the program, which is practically complete, includes:

"Anthracite Fuel Beds in Water-Gas

Manufacture," C. C. Wright, L. L. Newman and A. W. Gauger, Pennsylvania State College; "Anthracite Research at Mellon Institute," Harold J. Rose, Mellon Institute; "The Use of Anthracite in the Manufacture of Bricks," Hugh L. Campbell Jr., Hazleton Brick Co.; "Use of Anthracite in Cupolas," J. F. K. Brown, Hudson Coal Co.; "Practical Pointers in Domestic Stoker Installations," Joseph K. Goundie, Fritch Coal Co.; "Advanced New Methods of Draft Control on Hand-Fired Heaters," Allen J. Johnson, director, Anthracite Industries Laboratory; "Practical Merchandising of Anthracite From the Dealer Viewpoint," Carl A. Fraser, Carl A. Fraser, Inc.; "Trends in Boiler and Furnace Design for Greater Efficiencies With Anthracite," Milton A. Young, Catskill Metal Works; "Market Opportunities for Anthracite," J. D. Jillson, Anthracite Industries; "Factors Affecting Human Comfort in Addition to Temperature," C. P. Yaglou, Harvard School of Public Health; "Future Research for the Anthracite Industry," Frank Wright, Philadelphia & Reading Coal & Iron Co.; "Activated Carbon From Anthracite," Eric Sinkinson, Lehigh University; "Importance of Mineral Industries to the Commonwealth of Pennsylvania," W. M. Myers, Pennsylvania State College.

•

Portal to Portal Workday For Metal Miners

An opinion by the Wage and Hour Division of the U. S. Labor Department late in March defining hours of work in metal mines provides that the workday shall start when the miner reports for work at the mine portal and end when he reaches the portal at the end of the shift. Under this opinion, the workday also includes the aggregate time spent on the surface in obtaining and returning lamps, carbide and tools, and in checking in and out. It would not, however, include any fixed lunch period during which the miner is relieved of all duties, even though the lunch period is spent underground.

Administrator Fleming denied on March 31 a request by mine operators for reconsideration of the ruling, but postponed its effective date from April 1 to May 1.

•

To Hold Stoker Clinic

A coal stoker clinic will be held April 15–17 at the American Royal Building, Kansas City, Mo., under the auspices of the Bituminous Coal Utilization Committee for Kansas, Missouri and Oklahoma Producers. The committee has made extensive plans for a clinic to surpass last year's. New, improved stokers will be in constant operation to show how they work under varying conditions. In addition, experienced combustion engineers will be on hand to discuss the general causes of customer complaints and offer suggestions for removing their cause. Stoker engineers will explain details of proper installation of stokers. Also there will be displays of modern electrical controls, with attendants to explain their operation and installation. Admission will be free.

House and Senate Pass Resolution to Extend Bituminous Coal Act Two Years

WASHINGTON, D. C., April 4 — A resolution providing for a two-year extension of the Bituminous Coal Conservation Act of 1937 was passed by the House of Representatives on March 27 and was sent to the Senate for consideration. While continuing the 1c. tonnage tax on coal produced by participating operators and the penalty tax applicable in the event of nonparticipation, the resolution gives the office of Consumers' Counsel independent status. This post has been vacant since the demise of the Coal Commission, on June 30, 1939, when the Coal Division was set up in the Interior Department under Director Gray. The Senate passed the resolution today.

Secretary of the Interior Ickes urged extension of the act without delay as first witness before the House Ways and Means Committee, which began hearings on March 11. The lapse of even a day in extending the law, he said, would do great damage to the bituminous coal industry. He recommended that the life of the act be extended immediately, without any substantive amendments, and that changes be considered carefully and deliberately afterward.

While this act has been in effect, he said, labor relations in this industry have been excellent, and "it seems to me clear that the Congress should not prejudice this situation by failing to extend the coal act, which is the keystone of the industry. A basic element of the ability of the producers to pay an appropriate wage and in the power of the workers to obtain it is the maintenance of a floor under market prices that is sufficient to return the cost of production. The Congress should not pull this floor from under the feet of the industry." He praised the accomplishments of the Coal Division in the establishment of minimum prices, rules and regulations, etc., the benefits to the industry observable since Oct. 1 last, and the present-day handling of petitions for changes in the prices.

Has Had Only 5 Months Trial

Thomas Kennedy, secretary-treasurer of the United Mine Workers, said in a formal statement that his organization favored a two-year extension for the following reasons: "The act, for all practical purposes, has been in operation only a little over five months. An additional two years' extension is necessary so that the authority administering the act may have the benefit of experience under all circumstances—good, bad and normal—not only affecting production and production costs but also affecting selling and distribution factors, which, to date, have had little consideration because in the administration of the act the logical procedure is to carefully take one step at a time.

"A two-years' extension will permit of an improving administrative personnel and better long-range planning, whereas an extension for one year would create administrative problems difficult to solve and the legislative intent of the law could not be carried out. A two-years' extension will permit the next Congress to investigate and get the full facts as to the operation of this law in its entirety and enable Congress to outline future policies on a basis that will work for stability in the industry."

J. H. Wallin, representing the Cooperative Coal Operators and Truckers Association of Clearfield County, Pennsylvania, said that out of about 4,000,000 tons annually produced in this subdistrict, 30 per cent was by small mines producing less than 100 tons a day. He said these small operators were not being fairly treated by their district board, that they were not represented among the 16 board members, and that their petitions to the Coal Division for

Keeping Step With Coal Demand

Bituminous Coal Stocks

	Thousands Net Tons Feb. 1 1941	P. C. Change From Jan. 1 1941	P. C. Change From Feb. 1 1940
Electric power utilities	10,973	— 3.20	+20.99
Byproduct coke ovens	9,887	— 2.91	+21.41
Steel and rolling mills	933	+12.82	+43.32
Railroads (Class 1)	6,201	+ 4.73	+24.22
Other industrials*	13,926	— 5.33	+12.45
Total	41,920	— 2.45	+24.79

Bituminous Coal Consumption

	Thousands Net Tons Jan. 1941	P. C. Change From Dec. 1940	P. C. Change From Jan. 1940
Electric power utilities	4,670	—1.42	—4.73
Byproduct coke ovens	7,061	+0.89	+6.12
Steel and rolling mills	1,043	+6.98	—5.69
Railroads (Class 1)	8,181	+1.35	—3.02
Other industrials*	12,526	+5.67	+3.65
Total	33,481	+0.89	+0.89

* Includes beehive ovens, coal-gas retorts and cement mills.

Coal Production

Bituminous

Month of February, 1941, tons	41,450,000
Per cent inc. over Feb., 1940	5.53
Jan.-Feb., 1941, tons	85,520,000
Per cent inc. over Jan.-Feb., 1940	1.54

Anthracite

Month of February, 1941, tons	4,430,000
Per cent inc. over Feb., 1940	22.11
Jan.-Feb., 1941, tons	9,407,000
Per cent inc. over Jan.-Feb., 1940	2.61

Sales of Domestic Coal Stokers Vs. Oil Burners

Sales	Coal Stokers	Oil Burners
January, 1941	5,330	10,979
Per cent inc. over Jan., 1940	33.93	13.24

Index of Business Activity*

Latest week	143.9
Per cent change from month ago	— 0.28
Per cent change from year ago	+33.36

* *Business Week*, March 15.

Electrical Power Outputt

Week ended March 8, kw.-hr.	2,835,321,000
Per cent change from month ago	+0.39
Per cent change from year ago.	+15.10

† Edison Electric Institute.

Rubber veils for plum blossoms

A typical example of Goodrich development in rubber

THE "breeding" of fruit trees to produce better varieties is as exact a science as the breeding of race horses or show dogs. But the bees interfered. One flower would be emasculated of its pollen, the pollen of the selected blossom would be applied with a tiny brush, and all would be well until a bee buzzed around with pollen from a dozen flowers on his legs — and the perfect eugenic romance would be upset.

A fruit breeding expert saw a movie in which life-like spider webs were spun from Goodrich rubber cement. Why couldn't these rubber webs be spun around flowers, after breeding, to protect them from bees?

It was a tough problem. The rubber, blown in strands from a machine, had to be tough enough to withstand wind and insects, able even in tiny threads to stand intense sunlight, and yet be so compounded that after the ten days of pollen germination were over the rubber would disintegrate and fall away, since to pull it off the delicate blossom would ruin the flower.

Goodrich engineers have developed thousands of different rubbers with almost every conceivable property. Calling on this experience they finally perfected a combination which exactly meets these complicated requirements of the plant breeder. The way is opened to better strains of fruit, all because in many an orchard this year Goodrich rubber webs will protect the romance of two perfect blossoms from the villain traveling salesman, the bee. *The B. F. Goodrich Company, Mechanical Division, Akron, Ohio.*

B.F. Goodrich
First in Rubber

(*Another story of Goodrich development work appears on page 1*)

relief were always opposed by the district board. He suggested these two amendments to the act: (1) that under the terms of price-fixing provisions the base or lowest price should be determined on the coal as it is produced or as it comes from the mine; (2) that in the election of the board for any district a certain percentage of the membership be representatives of small truck operators.

Representing about 260 producing companies in Illinois, George W. Reed, vice-president, Peabody Coal Co., expressed the belief that the act should be "continued in effect long enough to give to Congress, to the industry and to the public an opportunity to observe the results of operation of the act under varying conditions, so that intelligent conclusions may be reached as to the advisability of modifying or further extending the law."

He declared that the industry was better stabilized than ever before; that the average mine price on domestic sizes is less than a year ago; that under present defense preparations there is some question as to whether two years would be sufficient for a fair demonstration of the merits or demerits of the act. He also presented statements by E. C. Mahan, chairman of the board, Southern Coal & Coke Co.; R. A. Young, District 14; and of District Board 13 urging extension of the act.

The final witness, on March 19, was Howard A. Gray, director of the Bituminous Coal Division, who recommended speedy passage of H. J. Res. 101, for extension of the act, without amending the act in any way. He said he considered the act to be in good, workable condition and believed that expiration of the act would return the industry to the chaotic conditions of years past. Nevertheless, he recommended that the language of the resolution be changed in two particulars: in order to insure continuance of the tax provisions contained in the 1937 act, the first would provide for two-year extension of the provisions of Chap. 33 of the Internal Revenue Code, under which chapter the act's tax provisions were transferred in the 1939 certification of internal revenue laws. The second provides for a two-year extension from *April 25, 1941*, in order that a lapse of one day would not result between the time the act expired four years from the date of its approval and the time the resolution became effective.

Would Clear River-Rail Row

He expressed the belief that a hearing should be held in order to clear up the river-rail situation; that he wanted a thorough investigation made and that he desired to see that justice on the one hand did not work an injustice on the other. He stated, however, that he would not attempt to put into language an amendment that might alleviate the rail-river problem.

Preceding the hearing, the Coal Producers' Committee, composed of 75 well-known operators, favoring extension of the act, issued an appeal urging producers to cooperate in the move to have the act extended. They were asked to send to the committee a statement of tonnage produced and number of men employed in 1940, as well as to grant the committee the right to state to Congress that they were in favor of reenactment of the law for two years.

Koppers Nurses Take First-Aid Course

Sixteen nurses on the home nursing staff of the Koppers Coal Co. were in Pittsburgh, Pa., during the last week of February, brought by the company from their stations in West Virginia to take the official first-aid training course of the U. S. Bureau of Mines. With completion of the 50-hour course, under the direction of Dr. A. L. Murray, surgeon of the Bureau of Mines, the nurses were awarded instructors' certificates qualifying them to teach first aid to the women and children of Koppers families in the 22 communities near the company's mines. Left to right, bottom row—Mary Warren and Edythe Frethy; center row—Freda Smith, Dorothy Shuff, Doris E. Craig, supervising nurse; top row—Mary Schwab, Marie Johnson, Mildred Brown, Mary Knight, Mary Pfister, Catherine Curry, Ruby Shirey, Eva McClung, Neoma Saul, and T. E. Lightfoot, director of welfare for the Koppers Coal Co.

Signatures to the Producers' Committee appeal included the following:

H. L. Findlay, vice president, Youghiogheny & Ohio Coal Co.

Douglas Millard, manager of sales, Colorado Fuel & Iron Corporation.

Fred S. McConnell, president, Enos Coal Mining Co.

Charles O'Neill, president, United Eastern Coal Sales Corporation.

George W. Reed, vice president, Peabody Coal Co.

G. D. Cowin, president, Bell & Zoller Coal & Mining Co.

W. M. Ryan, president, Central Illinois Coal Mining Co.

George B. Harrington, president, Chicago, Wilmington & Franklin Coal Co.

D. B. Lewis, Cornett-Lewis Coal Co.

C. V. Beck, secretary, Florida Coal Co.

E. R. Keeler, president, Franklin County Coal Corporation.

J. Louis Reiber, president, Mount Olive & Staunton Coal Co.

D. W. Buchanan, president, Old Ben Coal Corporation.

Kenneth Penwell, secretary, Penwell Coal Mining Co.

H. C. Woods, vice president, Sahara Coal Co.

Carl McFarlin, president, Tennessee Products Corporation.

C. M. Wasson, president, Wasson Coal Co.

J. H. Miles, president, Akron Coal Co.

Herbert E. Jones, president, Amherst Coal Co.

W. W. Walker, president, Ashland Coal & Coke Co.

T. M. Wyatt, vice president, Avis-Eagle Coal Co.

F. N. Barnes, president, Barnes Coal & Mining Co.

J. B. Mull, president, Barnes & Tucker.

Thomas Barnes, 2d, president, Bird Coal Co.

J. S. Riley, president, Buffalo Eagle Mines, Inc.

F. G. West, general manager, Butler Consolidated Coal Co.

W. I. Webb, president, Cambria Collieries Co.

William McBride, general manager, Canonsburg Coal Co.

Arthur B. Stewart, president, Davis Coal & Coke Co.

H. J. Nelms, president, Dye Coal Co.

R. A. Young, vice president, Fort Smith-Bonanza Coal Co.

H. S. Gay, vice president, Gay Coal & Coke Co.

P. M. Snyder, Gulf Mining Co.

W. P. Tams, Jr., president, Gulf Smokeless Coal Co.

Clifford Hawk, secretary, Hawk Coal Co.

L. G. Ball, vice president, Heisley Coal Co.

H. M. Wassum, vice president, Henderson Coal Co.

H. L. Yeager, president, Hitchman Coal & Coke Co.

H. C. Allread, treasurer, Hocking Valley Mining Co.

Ralph Moore, president, C. A. Hughes & Co.

T. E. Johnson, vice president, Hutchinson Coal Co.

Charles A. Owen, president, Imperial Coal Corporation.

James F. Hillman, president, Industrial Coal & Coke Co.

John B. Brunot, president, Irwin Gas Coal Co.

D. A. Burt, president, Jefferson Co.

Harry Huber, secretary-treasurer, Jefferson Coal & Coke Corporation.

George M. Jones, vice president, George M. Jones Co.

Harry F. Bovard, president, Keystone Coal & Coke Co.

(*Turn to page* 110)

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Arthur Downing, vice president, Monitor Coal Co.

J. F. Macklin, president, Monroe Coal Mining Co.

R. W. Wigton, president, Morrisdale Coal Mining Co.

E. H. Davis, executive vice president, New York Coal Co.

J. C. Nelms, vice president, Ohio & Pennsylvania Coal Co.

Rembrandt Peale, Jr., vice-president, Peale, Peacock & Kerr.

W. J. Richards, president, Pemberton Coal & Coke Co.

Mark W. Potter, president, Pennsylvania Coal & Coke Corporation.

F. F. Taggart, president, Pleasant Valley Mining Co.

O. C. Larsen, vice president, Powhatan Mining Co.

R. D. Stockdale, president, Red Jacket Coal Sales Co.

Heath S. Clark, president, Rochester & Pittsburgh Coal Co.

John D. Dickson, president, Shawmut Mining Co.

Louis Sitnek, president, Sitnek Fuel Co.

H. D. Everett, president, Smokeless Fuel Co.

George E. Frey, president, J. H. Somers Coal Co.

E. C. Mahan, chairman of the board, Southern Coal & Coke Co.

George K. Smith, president, Sunday Creek Coal Co.

E. S. Willard, general manager, United States Coal Co.

Harry T. Ewig, president, Valley Camp Coal Co.

S. A. Cottingham, president, Valley Mining Co.

K. M. Marquis, vice president, Warner Collieries Co.

Charles Dorrance, president, West Virginia Coal & Coke Corporation.

A. W. Dean, president, West Virginia-Pittsburgh Coal Co.

R. L. Berry, vice president, Wheeling Valley Coal Corporation.

Technical Advisory Board Meets At Battelle Institute

Meeting March 3 at Battelle Memorial Institute, Columbus, Ohio, the technical advisory board of Bituminous Coal Research, Inc., heard reports on the progress of the program started at Battelle for the coal industry on Nov. 15, 1940. The advisory group is composed of engineers who were recommended by member companies and appointed by Howard N. Eavenson, president of Bituminous Coal Research. Julian E. Tobey, vice president in charge of engineering for Appalachian Coals, Inc., was appointed chairman of the technical advisory board and of a smaller technical executive committee that will guide the program between meetings of the larger board.

The projects now under investigation were selected from those recommended by meetings of fuel engineers held in Pittsburgh in March, 1939, and in Chicago in April, 1940. These projects include the development of smokeless hand-fired stoves and furnaces, completely automatic home-heating units, gas producers, new firing devices for industrial process heating, and a coal-dust engine. Other projects are a study of dustproofing for porous coals, an information service, and the coordination of coal research.

With many of the larger cities renewing their campaigns of smoke prevention, one of the urgent needs of the industry, Mr. Tobey pointed out, is a stove that will burn both low- and high-volatile coals smokelessly and require a minimum of attention. Work is in progress on this subject, stated Ralph A. Sherman, supervisor of the Battelle fuels division, and the facilities of the Battelle fuels laboratory have been doubled for rapid measurement of the performance of stoves and furnaces that show promise in solving the smoke problem. Stove manufacturers are cooperating in this work.

The engineers agreed that efforts of the research program should be directed toward the development of equipment that will burn a wide variety of coals and that will handle coal and ash automatically. Howard Limbacher, of the Battelle staff, reported on the highlights of one stoker with automatic ash removal that had been under test in the laboratory for some weeks. A variety of coals has been used in these tests.

The technical advisory board recommended preliminary work on the use of coal in radiant tubes for industrial furnaces, investigations of new materials for dustproofing coals, and the coal-dust engine. Because of its value to the industry, cooperation of the research agency with the coal and stoker conferences that are held in a number of States was approved by the group.

After the meeting the engineers visited the Battelle fuels laboratory, where tests on stoves and stokers were discussed with Battelle fuels engineers G. C. Clavin, G. W. Gaertner, J. W. Humble, B. R. Landry, H. R. Limbacher, H. N. Ostborg and W. B. Ramsdale.

Members of the technical executive committee, who also are members of the technical advisory committee, in addition to Chairman Tobey, include the following: Thomas C. Cheasley, Sinclair Coal Co.; Henry F. Hebley, Pittsburgh Coal Co.; Fred K. Prosser, Norfolk & Western Ry.; C. A. Reed, National Coal Association; George G. Ritchie, Chesapeake & Ohio Ry.; R. L. Sutherland, Truax-Traer Coal Co.

In addition to the foregoing, the following are members of the technical advisory board: Paul Barkman, Cleveland Cliffs Iron Co.; C. B. Baton, Baton Coal Co.; G. A. Brady, Middle States Fuels, Inc.; J. D. Doherty, Koppers Coal Co.; Homer M. Faust, New York Coal Sales Co.; L. W. Householder, Rochester & Pittsburgh Coal Co.; E. J. Kerr, Island Creek Coal Co.; E. S. Pugh, Raleigh Smokeless Coal Co.; R. L. Rowan, General Coal Co.; John Scott, New River Co.; L. A. Shipman, Southern Coal & Coke Co.; R. F. Stilwell, Red Jacket Coal Sales Co.; Max A. Tuttle, Knox Consolidated Coal Corporation, and a representative of the Big Sandy-Elkhorn Coal Association to be appointed.

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Filter Agent From Refuse

A method for utilizing coal from refuse dumps of mines for the purification of water has been discovered by the Bureau of Mines' Southern Experiment station, at Tuscaloosa, Ala. Investigations carried out in cooperation

Bituminous Coal Research technical advisory board meets at Battelle Memorial Institute

Left to right, inner row: Messrs. Sutherland, Brady, Ritchie, Shipman, Hebley, Horan, Scott and Limbacher. Outer row: Messrs. Barkman, Tuttle, Householder, Prosser, Kaiser, Rowan, Clavin, Eavenson, Tobey, Sherman, Reed, McManus, Landry, Scholz, Doherty, Kerr, Faust and Stilwell.

with the University of Alabama have convinced the Bureau that the refuse from coal-mine washeries generally contains some good coal mixed with the waste. This coal, it is said, can be readily made into "activated carbon," a substance used by many water-supply plants to make water for drinking purposes clear, tasteless and odorless.

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Approves Plan to Mine Coal In Ohio River Bottom

The West Virginia Public Land Corporation approved tentatively on March 25 a plan to "mine" coal from the bottom of the Ohio River but left to a committee of three of its members the negotiation of details of a lease to the Atlas Coal & Dredge Co. Governor Neely, ex-officio chairman of the corporation, directed the committee to report back to the five-man corporation within ten days. The corporation also includes Attorney General Clarence W. Meadows, Auditor Edgar B. Sims, Commissioner of Agriculture J. B. McLaughlin, and Dr. W. W. Hodge, director of the engineering experiment station at West Virginia University. The committee comprises Messrs. Meadows, Sims and Hodge.

Everett Drennen, former president of the West Virginia Coal & Coke Corporation, will direct mining operations for the Atlas company, which has headquarters in Wheeling. He explained that his company proposed to mine the coal from the Pittsburgh seam at the bottom of the river with dredges. He said that silt and some roof coal cover the usable coal, but that a seam about 5 ft. thick may be recovered from the river. The company seeks to lease from the State 1,336 acres of river bottom extending from Moundsville about 15 miles down the river. In some places, said Mr. Drennen, the coal lies as much as 35 ft. below the river bed.

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Anthracite Engineers to Meet

The Anthracite Section of the American Institute of Mining and Metallurgical Engineers will hold its spring meeting April 18 at Pottsville, Pa. The headline feature will be an address on "Strategic War Minerals" by Representative J. G. Scrugham of Nevada. There also will be sound motion pictures on mine safety.

These arrangements were made at a meeting of the executive committee held March 17 at the Hotel Altamont, Hazleton, Pa. Besides W. H. Lesser, chairman, those in attendance were: C. A. Garner, S. H. Ash, Evan Evans, L. D. Lamont, Wilmot Jones, Floyd Sanders, C. D. Rupert, H. H. Otto and H. D. Kynor.

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Sunshine Mine Resumes

For the first time since closing because of financial difficulties, Sept. 4 last, the former Sunshine Anthracite Coal Co. mine at Clarksville, Ark., has resumed operation under the name of the Ozarks Coal Co. About 100 men are employed.

Consolidation, Elkhorn and South-East Receive Awards at Pikeville

AUXIER MINE of the North-East Coal Co., Mine No. 2 of the Elkhorn Coal Corporation and Mines 204–7 of the Consolidation Coal Co. were awarded bronze safety plaques at the dinner and annual meeting of the Big Sandy Elkhorn Coal Mining Institute, Feb. 21, Pikeville, Ky. F. M. Correll, safety inspector, Consolidation Coal Co., Jenkins, was elected president. W. R. Campbell, retiring president, was in the chair.

Auxier had the best accident record for 1940 among the Class A (larger) mines. The plaque carries the names W. F. Pioch, general manager; Herbert Wheeler, superintendent; Lon Coburn, general foreman, and Ora Bickford and Charles Burke, foremen. Fred Sherman, superintendent, Thealka mine, and G. J. Beidenmiller, treasurer and purchasing agent, filled the gaps caused by the absence of Messrs. Pioch and Coburn and Mr. Beidenmiller spoke in acceptance.

On the Elkhorn Coal plaque award for the best accident record in the Class B (smaller mines) are the names of Harry B. Crane, general superintendent; I. S. Ramsey, superintendent; Clyde Hood, general foreman; Andrew Adams, night foreman, and three other foremen, J. E. Jackson, William Wright and Toney Elovitz. These were present to receive that plaque: Messrs. Ramsey, Hood and Elovitz.

The award to Mines 204–7, Consolidation, was a special for "4,811,339 tons of coal mined with 10,290,000 man-exposure-hours without a fatality." Names on the plaque are "T. W. English, division manager; R. C. Denny, superintendent; Grady Turner, general foreman; F. M. Correll, inspector." While the bronze plaque was on order Mr. English resigned, however, and was replaced by H. B. Husband. Mr. Denny, L. E. Kelly, assistant division manager; Mr. Correll and Mr. Turner stood to receive the plaque.

Silver and bronze service buttons for two year and one-year supervisions without a lost-time injury were awarded to Polk Campbell, Koppers Coal Co.; J. H. Mosgrove and G. A. Hixon, both of the South-East company; E. H. Smith, Goose Creek Mining Co.; Morgan Johnson, Elkhorn Coal Corporation, and Diamond Waddles, Inland Steel Co. All are section foremen and received one-year buttons, except Mr. Hixon, who is outside foreman for the Inland Steel Co. and who received a two-year button.

"We need safety programs," said W. E. Wheeler, senior inspector, Kentucky Department of Mines and Minerals, "rigid enough that they do not bend at the top, down at the bottom or in the middle." He cited the case of one company which found that 85 per cent of the injuries happened to men who did not attend the coal-company safety meetings. Mr. Wheeler discussed the January, 1941, report for the 32 mines of the district which in the aggregate produced 777,917 tons with 78 injuries and 2 fatalities. For the whole of 1940 the tons per fatality figure was 498,050 compared to 396,017 for 1939 and 441,086 for 1937.

Other speakers were L. W. Huber, district manager, Mine Safety Appliances Co.; L. H. McGuire, engineer in charge, Norton Safety Station, U. S. Bureau of Mines, Norton, W. Va., and J. H. Edwards, associate editor, *Coal Age*.

The institute meeting paused for sixty seconds of silence in memory and tribute to the late John T. Ryan, and moved that the secretary draw up and send messages of condolence to the family and to the executives of the Mine Safety Appliances Co., which Mr. Ryan headed up to the time of his death in Florida, Feb. 20.

Institute Officers

President—F. M. Correll, safety inspector, Consolidation Coal Co., Jenkins.

Vice Presidents—J. T. Parker, superintendent, Inland Steel Co., Wheelwright; Herbert Wheeler, superintendent, North-East Coal Co., Auxier; Harvey Maynard, safety director, Clear Branch Mining Co., Ligon.

Secretary-Treasurer — A. D. Sisk, safety director, Big Sandy-Elkhorn Coal Operators' Association.

Directors—W. R. Campbell, general foreman, Koppers Coal Co., Weeksbury; G. C. Sutherland, safety engineer, Inland Steel Co., Wheelwright; M. M. McCormack, superintendent, Consolidation Coal Co., Van Lear; V. D. Picklesimer, superintendent, South-East Coal Co., Seco; R. C. Denny, superintendent, Consolidation Coal Co., Jenkins; Edgar Dale, superintendent, Elkhorn Coal Corporation, Fleming; Fred Sherman, superintendent, North-East Coal Co., Thealka; M. E. Prunty, superintendent, Consolidation Coal Co., McRoberts; Diamond Waddles, foreman, Inland Steel Co., Wheelwright; J. E. Green, superintendent, Utilities Elkhorn Coal Co., Pikeville; M. K. Reed, superintendent, Turner Elkhorn Coal Co., Drift; and B. F. Gish, general foreman, South-East Coal Co., Seco.

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New Preparation Facilities

DELANO ANTHRACITE COLLIERIES CO., Park No. 1 Colliery, Park Place, Pa.: Contract closed with Wilmot Engineering Co. for cleaning plant to prepare mine-run and stripping coal; equipment to consist of sizing shakers, two 6-ft. Wilmot Hydrotators to clean rice, barley and No. 4 buckwheat; one 12-ft. Wilmot classifier to prepare No. 5 buckwheat, and high-speed Wilmot and vibrator type screens for dewatering; capacity, 150 tons feed per hour; new structure, to be completed in twelve weeks.

DIAL ROCK COAL CO., Exeter, Pa.: Contract closed with Wilmot Engineering Co. for one 36-in. Wilmot hydroseparator to clean barley coal.

DUQUESNE LIGHT CO., Mine Near Greensboro, Pa.: Contract closed with Roberts &

(*Turn to page* 116)

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Schaefer Co. for complete steel river loading tipple and preparation plant; equipment to include RandS revolving dump and trip feeder, rock-disposal machinery, picking and crushing facilities for lump coal, hydroseparator coal-washing equipment for 5x1-in. coal, complete sludge recovery equipment, belt conveyor to river and loading boom to barges; capacity of plant, 600 t.p.h. of mine-run coal. Also will furnish and erect a 50,000-gal. steel water tank and complete pumping and piping and fire-hydrant facilities.

HEISLEY COAL CO., Nanty Glo, Pa.: Contract closed with Roberts & Schaefer Co. for additional crushing facilities to reduce 1¼-in. to ¾-in. size; capacity, 100 t.p.h.; to be completed May 1.

MONROE COAL MINING CO., Revloc, Pa.: Contract closed with Roberts & Schaefer Co. for additional crushing facilities to reduce 1¼-in. to ¾-in. size; capacity, 100 t.p.h.; to be completed May 1.

PENNSYLVANIA COAL CO., No. 1 Dunmore Colliery, Dunmore, Pa.: Contract closed with Wilmot Engineering Co. for complete fine-coal cleaning plant, equipment to consist of standard sizing shakers, one 6-ft. Wilmot Hydrotator for No. 4 buckwheat and one 12-ft. Wilmot classifier to clean No. 5 buckwheat, high-speed Wilmot and vibrator type screens for dewatering; capacity, 50 tons per hour; structure to be completed in twelve weeks.

PITTSBURGH COAL CO., Montour Mine, Lawrence, Pa.: Contract closed with Roberts & Schaefer Co. for complete remodeling of tipple to handle mine-run coal at rate of 1,000 t.p.h. with revolving dump, screening and picking facilities, and rock-disposal equipment; to be completed July 1.

REPUBLIC STEEL CORPORATION, Indianola, Pa.: Contract closed with Roberts & Schaefer Co. for installation in existing tipple of complete Hydrotator and Stump Air-Flow cleaning plant to clean 0x1½-in. machine cuttings; capacity, 100 t.p.h.; to be completed July 1.

In the table on p. 74, February *Coal Age*, headed "New Anthracite Preparation Facilities in 1940," "preparation equipment" pertaining to Harry E. Coal Co. was erroneously designated as Koppers-Rheolaveur. This preparation equipment is Menzies, being Menzies cones furnished by Koppers-Rheolaveur Co.

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Acquires Windsor Coal Stock

McAlester Fuel Co., McAlester, Okla., has purchased from the Joe Klaner estate, Pittsburg, Kan., two-thirds of the stock of the Windsor Coal Co., Windsor, Mo., and officials of the McAlester company have become officials of the Windsor organization, as follows: J. G. Puterbaugh, president, vice Joe Klaner, Jr.; F. M. Eviston, vice president and sales manager; Carl Oman, secretary; and E. P. Joyner, treasurer.

The reorganized company has ordered from the Marion Steam Shovel Co. a 5323 electric shovel which will be equipped with a 105-ft. boom and 15-yd. dipper, to be in operation by Oct. 1. With this addition to its Bucyrus 320 8-yd. steam shovel and

Marion 300 8-yd. electric shovel the company will have a capacity of about 1,000 tons of coal per day.

The company also has contracted with the McNally-Pittsburg Mfg. Corporation for installation of an additional Norton No. 4 washing unit and other equipment which will completely modernize its preparation plant and enable it to wash all coal produced, from 6-in. down.

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Seaboard Wins Fight Against Price Fixing Provisions

Divided four to four, the Supreme Court of the United States affirmed on March 31 a lower court decision holding that certain coal mining activities of the Seaboard Air Line Ry. are exempt from the price fixing provisions of the Bituminous Coal Act. The decision overruled the position of Director Gray of the Bituminous Coal Division that the company had employed a contract "device" to protect itself from price increases resulting from operation of the act.

The government testified that a decision for the company would point the way for resumption of cutthroat competition in a large segment of the industry. Seaboard applied for exemption from the act under the provision excluding "coal consumed by the producer."

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Koppers Co. Cleared In Carswell Blast

A coroner's jury at Welch, W. Va., reported on March 5 that gas, probably freed by a slate fall, ignited by an arc from a nip attached to a power cable caused the Jan. 22 explosion at the Carswell mine of the Koppers Coal Co., in which five men lost their lives and 14 were injured.

The jury said that "the small area damaged would indicate that all reasonable precautions" had been taken by the company. Ventilation in the mine was termed "good." The jury added that dust figured in the blast.

P. C. Thomas, vice president of the company, testified that the company produced more than a million tons of coal without a fatality and "spent a great deal of effort and money" in order to avert accidents. The State Department of Mines also filed a report in which it was stated that a spark from a cable nip ignited accumulated gas.

The State department made the following recommendations as being conducive to greater safety in mechanical loading mines:

1. The use of water on cutter bars.
2. The use of sprinkling systems at loading heads, tailpieces and working faces.
3. The maintenance of rock dust as close to the face as practicable.
4. Accumulations of coal dust to be loaded out periodically during each shift.
5. Electrical cables to be maintained free of bare places or extensive abrasions. Cables to be spliced and vulcanized in shops away from working places.
6. Auxiliary electrical cables to be on hand to replace damaged cables.
7. All connections to trolley or feed wires should be secure and substantial. Distribution of electrical power by means of cables

to two or more electrical units at working faces to be made through plugs, junction boxes or switchboards.

8. Air readings to be made and recorded each shift.

A report by the U. S. Bureau of Mines made public on March 23 said that rock-dusting carried out in accordance with recommendations of the Bureau probably saved from death or serious injury 127 other men who were underground at the time of the explosion. The report attributed the explosion to an ignition of mine gas by "an arc from the nips of a mining-machine cable which were attached to a power cable."

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Break in Appalachian Suspension Predicted, With Possible North-South Split

OPERATIONS in the Appalachian bituminous area and in several of the outlying districts were suspended the first week in April, but early resumption was predicted as this issue of *Coal Age* went to press. Suspension followed failure of the Appalachian joint wage conference, which started deliberations at the Hotel Biltmore, New York City, on March 11, to agree upon terms for a new contract or on a formula acceptable to both operators and the U.M.W. for continuing work during negotiations. The Federal Government, in the person of Dr. John L. Steelman, head of the Labor Department conciliation service, moved in on the scene late in March backed by a plea from President Roosevelt that there be no interruption to production.

As the joint subcommittee of the Appalachian conference resumed its gruelling sessions April 7, indications pointed to at least a temporary split between Northern and Southern producers over the 40c. differential accorded the South in recent contracts. An agreement for a basic wage increase of $1 in the North and $1.40 per day in the South, with an additional 40c. on certain classes of mechanical mining, was said to be in the making. Other concessions under discussion include one-week vacation with a "token" payment of $20 for the period, establishment of safety pit committees and clarification of seniority rights. Abolition of the 40c. differential, of course, is bitterly opposed by the South.

Stoppage became effective at midnight March 31 with expiration of the old agreement, but, as April 1 is celebrated as a holiday commemorating the anniversary of the eight-hour day, the tie-up did not actually begin until April 2. John L. Lewis, president of the United Mine Workers, said the shutdown was inevitable, as the union never worked without a contract.

Violence broke out in Harlan County, Kentucky, on April 1 coincident with the shutdown. Non-union miners and union pickets at the R. C. Tway Coal Co., near Harlan, were reported as "shooting the place up," but no one was hit. A guard at the Mary Helen Coal Corporation, Coalgood, died several hours after being shot. At the Harlan Central Coal Corporation mine, Totz, a U.M.W. picket was shot in the leg. Four more were killed and five wounded in a battle between non-unionists and pickets on April 2 at the Crummies Creel Coal Co. mine, Crummies, Ky.

The negotiations stalled over the union's insistence that any wage increases granted

Wide World Photo

Bituminous Operators Prepare for Negotiations With Union

Ezra Van Horn, executive vice president, Ohio Coal Association, with members of the negotiating committee of Appalachian coal operators who met with United Mine Workers in an attempt to draw up a new wage contract. The group is shown at the Hotel Biltmore as plans were discussed for negotiations. Left to right: Mr. Van Horn; L. T. Putman, general manager, Raleigh-Wyoming Mining Co.; Charles O'Neill, president, United Eastern Coal Sales Corporation; J. B. Morrow (standing), president, Pittsburgh Coal Co., and L. C. Gunter, president, Southern Appalachian Coal Operators' Association.

be made retroactive to April 1. This proposal was rejected by the operators at the beginning of negotiations, but the union's policy committee refused to recede from its position. Illinois, Indiana, Utah and Alabama unions, outside the Appalachian field, took a similar stand in negotiations in those areas.

When the conference convened on March 11, Ezra Van Horn, president, Ohio Coal Association, was elected chairman, and Thomas Kennedy, secretary-treasurer, United Mine Workers, was made secretary of the conference. Truman E. Johnson, vice-president, Hutchinson Coal Co., was named assistant secretary, and Harry G. Kennedy, Charleston, W. Va., was made sergeant-at-arms. Other operator representatives were Charles O'Neill, president, United Eastern Coal Sales Corporation; L. T. Putman, general superintendent, Raleigh-Wyoming Mining Co.; J. B. Morrow, president, Pittsburgh Coal Co.; and L. C. Gunter, president, Southern Appalachian Coal Operators' Association. Also appearing for the union were John L. Lewis, president; Philip Murray, vice-president; Percy Tetlow, special representative; James Mark, president, District 2; Van A. Bittner, president, District 17; and William Turnblazer, president, District 19.

Want 200 Days' Work a Year

Demands by the union, presented in a formal statement read by Mr. Lewis, included retention of the 7-hour day and 35-hour week with a blanket increase of $1 a day for all regular classifications of inside and outside day men, a minimum guarantee of 200 days' work a year, two-week vacations with pay, and rigid safeguards against accidents enforceable by the organization. The union also asked that combined cutting and loading rates be increased 12c. a ton, 11c. of this to be added to the existing rates for loaders and 1c. to cutting rates. Trappers and partly handicapped old men would receive an increase of 75c. a day under the proposed union schedules, while monthly men would receive a directly proportionate advance, the minimum day rate to be "$6 without exception."

The union asked also for an increase of 20c. a ton in pick-mining rates and of 15 per cent in yardage and deadwork rates. Rates for conveyor and all other forms of mechanized mining, it was proposed, "shall be adjusted in a manner that will enable mine workers employed on mechanized units to earn an amount in wages commensurate with their increased productive efficiency," and "in all cases the minimums established shall be higher than the earnings of hand loaders." The principle employed in adjusting rates at all strip-mine operations shall be the same as that applied to conveyor and other forms of mechanized mining. Double time shall be paid for all work performed on Sundays and holidays.

In connection with the demand for a guarantee of not less than 200 days of work annually, the union asked that day and monthly men be paid at the regular rates provided in the various district agreements, and tonnage men at the rate of $7.50 a day for each day less than the guaranteed 200. The demand for paid vacations, rejected

Wide World Photo

Miners' union officials prepare wage demands

Members of the national policy committee of the United Mine Workers met at the Hotel Roosevelt on March 11 to formulate wage and hour demands to be made at joint meeting with operators. Shown left to right are: Philip Murray, vice president, United Mine Workers; John L. Lewis, president, and Thomas Kennedy, secretary-treasurer.

two years ago by the operators, was supported by the assertion that "vacations with pay have been accepted by American industry as a basic condition of employment in employer-employee relationships" and there is no justification for withholding vacation grants from the men who mine the coal.

Mr. Lewis contended that the wage increases demanded would add a maximum of only 17c. a ton to the price of bituminous coal, based on figures obtained from records of the Bituminous Coal Division. He said he was certain this increase could be borne by the industry out of present and prospective profits and improvement of management and production methods. He was emphatic, however, that the union was determined to obtain the increases, saying that 60 per cent of the miners now earned only $600 to $700 annually, with the earnings of "tens of thousands" as low as $300 a year.

A demand for greater safety in the mines stated that "the progressive increase of fatal and non-fatal accidents in the nation's coal industry has become an alarming and tragic problem." Fatalities for the year 1940, Mr. Lewis said, reached the figure of 1,420, an increase of 342 over the preceding year, while non-fatal coal-mine accidents in 1939 totaled 41,500, representing a ratio of 49 non-fatal accidents for every fatal accident in that year. Such accidents, according to the union statement, added 20c. a ton to the cost of production, or a total in 1940 of $90,600,000, which had to be paid by the consumer.

The mine workers proposed that in the new contract there be written a clause that would give the right to a safety committee of mine workers to inspect any mining operation, and when dangerous and menacing conditions were found, to authorize the men to refrain from work until conclusive inspections and findings were made by State and Federal authorities.

Wide World Photo

Appalachian operators and U.M.W. in joint meeting on new contract

Proposals for a new contract affecting miners in the bituminous coal industry were presented March 12 by officials of the United Mine Workers, headed by John L. Lewis, at a joint conference with operators at the Hotel Biltmore. Mr. Lewis is shown addressing the joint meeting.

After a one-day recess to enable the operators to consider the proposals, Mr. O'Neill submitted on behalf of the operators a resolution for a straight two-year extension of all existing district wage agreements in the Appalachian territory. He further suggested that consideration be given to the establishment during the national emergency of a 7-hour day, 6-day week or an 8-hour day, 5-day week. This, he said, would increase miners' earnings from 14 to 20 per cent. The coal industry, said Mr. O'Neill, was the only essential commodity-producing defense industry operating on a 7-hour day and 5-day week.

The operators' spokesman declared the wage schedules proposed by the union would add $108,778,800 to the nation's coal bill, and $220,000,000 annually if the cost of the proposed vacations with pay, a guarantee of 200 days' work annually, and other suggested readjustments were taken into consideration.

Negotiations on New Agreement In Anthracite Field Start

Negotiation of a new contract covering wages and working conditions in the anthracite fields of Pennsylvania began in the Hotel Commodore, New York City, on April 8 as *Coal Age* was going to press. The new agreement is to become effective on May 1.

The miners' scale committee recommended demands for a wage increase of 20 per cent for men working on a tonnage basis and $1 a day increase for those paid by the day or month and for other workers around the mines, with a minimum of $4.62 for a seven-hour day; also two-weeks' vacation with pay, time and a half for overtime, double time for Sundays and holidays, seniority rights to eliminate discrimination in layoffs and promotion, and no dismissals because of age.

After some ironic and sarcastic remarks by Mr. Lewis the conference adopted a motion presented by Mr. O'Neill for selection of a subcommittee to begin discussion of a new agreement. Named to represent the operators in this group were: Messrs. O'Neill, Putman, Morrow and Gunter. The union originally named Messrs. Tetlow, Mark, Bittner and Turnblazer, but this became a revolving body, as some of its personnel changed constantly.

When the operators rejected the proposal that any wage increases be made retroactive, on March 18, the miners' policy committee adopted a resolution authorizing union officers in bituminous districts outside the Appalachian area to continue work after March 31 pending conclusion of an agreement in the Appalachian area, and to proceed with negotiating agreements in those districts on the basis of a retroactive clause. States covered by this resolution include Illinois, Indiana, Iowa, Utah, Kansas, Colorado, Alabama, Arkansas, Oklahoma, Texas, Wyoming, western Kentucky, Montana and Washington. Annual produc-

tion of these states is 120,000,000 tons. Production of the Appalachian area, comprising Pennsylvania, Ohio, Michigan, Maryland, Virginia, West Virginia, eastern Kentucky and Tennessee, is more than 300,000,000 tons annually.

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Carrolltown Builds New Plant

Carrolltown Coal Co. has constructed a new tipple and cleaning plant at the upper opening of its Victor No. 9 mine, at St. Benedict, Pa., shortening the haul about 2 miles. The cleaning equipment consists of screening plant, pneumatic tables and hand picking tables. The old plant has been dismantled and some of the equipment utilized in the new plant.

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Morgan Loses T.V.A. Job Battle

Arthur E. Morgan, deposed chairman of the Tennessee Valley Authority, on March 17 lost in the U. S. Supreme Court his fight for reinstatement and back pay. The court refused to review a Circuit Court of Appeals decision dismissing his suit.

President Roosevelt removed Dr. Morgan as head of T.V.A. in March, 1938, after a White House hearing on Dr. Morgan's charges of maladministration in the T.V.A. The President charged Dr. Morgan with "contumacy" in declining to offer proof of his charges. Dr. Morgan contended that a Congressional investigating committee was the proper body before which to present his evidence.

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Homes for New Workers

The Page Pocahontas Coal Co. has let a contract for the construction of 20 new houses to take care of additional miners being employed by the Buchanan County (Virginia) company. Construction is to begin immediately.

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Moses F. Peltier Dead

Moses F. Peltier, 65, vice president, Peabody Coal Co., and for the last four years president of the Illinois Coal Operators' Association, died April 2 of a heart attack in his office in Chicago. He worked in the mines as a youth in Bureau County, Illinois; his first job with the Peabody company was as a civil engineer.

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Frick Rescue Station Burns

Buffington mine-rescue station of the H. C. Frick Coke Co., near Brownsville, Pa., was destroyed by fire on March 1. Thirty sets of oxygen breathing apparatus, together with gas masks, accessories and supplies for the apparatus and gas masks, were consumed in the fire. The flames are believed to have been started by the heating unit in the station. The equipment and station will be immediately replaced by the company.

West Virginia Will Engage 13 More Inspectors

Thirteen additional mine inspectors are to be hired by the West Virginia Department of Mines beginning July 1, according to an announcement on March 31 by N. P. Rhinehart, chief of the department. This will enable inspections to be made at least every three months, as required by law. The 1941 Legislature authorized the employment of additional inspectors to meet the requirements of the State mining law; the department is able, on the average, to make inspections about once every five months now, according to Mr. Rhinehart.

There are tentative plans for creating 16 new mining districts in addition to the 25 now existing. They must be approved, however, by the State Budget Director. There are 25 district inspectors and 7 inspectors-at-large. Chief Rhinehart also said that consideration was being given to the employment of an electrical engineer. He would be used principally as a consultant for inspectors, but would do field work as well. Six years' experience in the mines is a requirement for the new inspectors, as well as possession of a foreman's certificate. An additional appropriation of $100,000 annually for the next two years was passed by the Legislature for expansion of the Mines Department's activities.

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Personal Notes

THOMAS. BODYCOMB, employed since 1907 by the Colorado Fuel & Iron Corporation, has been appointed to the Colorado board of coal-mine examiners by Governor Ralph L. Carr. He has been active in first-aid work for the last 25 years. The board consists of two miners, one mine operator, one engineer and the chief State coal-mine inspector.

TROY BRYANT has been appointed construction foreman at Olga No. 2 mine of the Carter Coal Co., Caretta, W. Va.

ALBERT DANIELS, employed by the Hayden Coal Co., Haybro, has been appointed to the Colorado board of coal-mine examiners. He is a mechanic and electrician at Hayden No. 3 mine.

J. H. (Jack) EDWARDS, associate editor of *Coal Age*, was the speaker at a luncheon of the Huntington (W. Va.) Chapter of the American Association of Engineers on March 1 at the Hotel Frederick. His subject was "Mining of Fluorspar of Kentucky and Illinois."

RILEY ENGLAND has been made section foreman by the Mallory Coal Co., Logan County, West Virginia.

T. W. ENGLISH, until recently manager of the Kentucky division, Consolidation Coal Co., Jenkins, Ky., has been appointed labor adviser for the Big Sandy-Elkhorn Coal Operators' Association, which maintains offices at Ashland, Ky.

JOHN FLAHERTY has been promoted to assistant mine foreman by the Consolidation Coal Co. at mine No. 32, Owings, W. Va.

WALTER GILL, Peoria, has been named a

member of the Illinois Mining Board. He is president of the Coal Producers' Association of Illinois and has operated coal mines near Peoria for more than 20 years.

WILLARD GILLESPIE has been appointed section foreman at Berwind Nos. 1 and 5 mines of the New River & Pocahontas Consolidated Coal Co., Berwind, W. Va.

TYRUS HAMMOND has been promoted to assistant foreman by the Red Jacket Coal Corporation, Red Jacket, W. Va.

T. C. HAYES has been named assistant superintendent at Imperial and Monarch mines of the Virginia Iron, Coal & Coke Co., Leona Mines, Va., as of April 1.

G. E. HOOVER, formerly chief engineer, Gauley Mountain Coal Co., Ansted, W. Va., has been appointed assistant to the engineer in charge of coal properties, Chesapeake & Ohio Ry., Huntington, W. Va.

JONES KENNEDY has been promoted to assistant foreman by the Red Jacket Coal Corporation, Red Jacket, W. Va.

J. C. LEWIS, Des Moines, Iowa, formerly president of District 13, U.M.W., later a member of the Bituminous Coal Commission, and since 1939 special representative of the United Mine Workers, has been appointed a labor consultant on the staff of the Office of Production Management. He will devote most of his time to promoting continuity of employment in plants affected by establishment of mandatory priorities.

GEORGE WALTER LONG has been promoted to mine foreman by the Fairmont & Baltimore Coal & Coke Co., Shinnston, W. Va.

WILLIAM C. MCCULLOCH, formerly coal preparation manager of United Electric Coal Cos., operating in Illinois, has been engaged to act in a similar capacity by the Roberts & Schaefer Co., Chicago.

JOSEPH E. MCMULLEN, Collinsville, has been appointed to the Illinois Mining Board. He worked in Kansas before moving to Collinsville in 1912, passing the examinations for mine manager and mine examiner in 1919. He is a member of the Progressive Mine Workers.

JOHN MENTLER, Centralia, has been made a member of the Illinois Mining Board. He has worked in coal mines in the State for about 40 years, serving three years on the State Mining Board under Governor Emmerson. He also was an officer and special representative of District 12, United Mine Workers, for many years.

DAVID C. PRINCE, manager, commercial engineering department, General Electric Co., Schenectady, N. Y., has been nominated for the presidency of the American Institute of Electrical Engineers for 1941-42.

BEN SCHULL, Pinckneyville, has been appointed a member of the Illinois Mining Board. He is vice president in charge of operations for the Binkley Mining Co. He has had many years' experience as a workman and operator in shaft mines in various sections of the State.

C. K. TIECHE has been appointed acting superintendent of Imperial and Monarch mines of the Virginia Iron, Coal & Coke Co., Leona Mines, Va., effective April 1.

FRELIN TROGDEN has been promoted from

section foreman to safety inspector of all the Mallory Coal Co. mines, Logan County, West Virginia.

PAUL WEIR has been elected president of the Perry Coal Co., St. Louis. Other officers named are: M. C. YOUNG, vice president; CARL VOIGT, treasurer, and CARL H. SCHLAPP, JR., secretary. The company has succeeded to the business and properties of its former affiliates, Gillespie Coal Co.; Retola Land, Coal & Mining Co. and West Virginia Coal Co. of Missouri, which will henceforth be operated under the Perry name.

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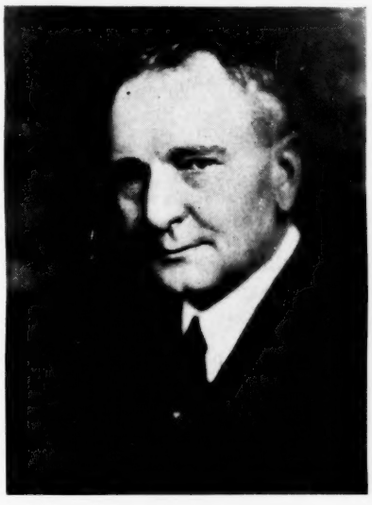
Obituary

DAVID J. RODERICK, 77, a mine inspector in the Hazleton (Pa.) area for 38 years, died March 25 at his home in Hazleton of pneumonia. He started as a breaker boy, and after years of experience as a miner, rock tunnel worker and timberman became a foreman. He was appointed an inspector in 1902, retiring a year ago.

F. V. H. COLLINS, 63, president, Bair-Collins Co., Roundup, Mont., died Feb. 17. His entrance into the coal industry of Montana occurred when he opened the Keene mine in 1921. He developed the present Prescott operation in 1930. His other business interests



F. V. H. Collins

included the practice of law, oil development, real estate and ranching. He was active in the development of the Bituminous Coal Code in N.R.A. days, and at the time of his death was chairman of District 22 Producers' Board.

HARVEY WELTON, 70, a pioneer in the Canadian coal industry, died March 4 at his home in Newcastle, N. B., after an illness lasting several weeks. He was president of Welton & Henderson Ltd., Harvey Welton Ltd. and Harvey Welton & Sons, and senior partner in the firm of Welton, Henderson & King.

J. W. WATSON, 50, superintendent of Nos. 6 and 7 mines, United States Coal & Coke

Co., McDowell County, West Virginia, died March 22 in a Welch (W. Va.) hotel following a brief illness. He had been in failing health for the last two years. Beginning as a miner in 1911, he held numerous positions with the company before becoming superintendent several years ago.

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Unemployment Pay Awarded Captive Miners

Because they had no argument with the management and were willing to work if given the opportunity, members of the Captive Coal Miners of America (A.F.L.) were held by the Alabama Supreme Court on March 28 to be entitled to unemployment compensation for the six weeks mines were closed by the operators in April and May, 1939. The latest decision upheld a verdict of the Court of Appeals in a test case brought in Jefferson Circuit Court by William M. Drummond, one of about 2,000 captive union members involved. He was an employee of the Tennessee Coal, Iron & Railroad Co.

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Higher Wages Recommended For Nova Scotia Mines

Wage increases for employees of Dominion Coal Co., Cumberland Railway & Coal Co. and Old Sydney Collieries, Ltd., have been recommended by a special labor tribunal which met in February at Halifax, it was announced March 15 by N. A. McLarty, Minister of Labor. The Minister's statement said the tribunal, headed by Justice C. P. McTague, of the Ontario Supreme Court, had found that in the case of the Dominion Coal Co. and Cumberland Railway & Coal Co., employing about 11,000 men, "there was available money out of which certain advances may be paid."

Mr. McLarty's statement said the tribunal had suggested that "mechanics, machinists and a long list of other employees in certain classes" be given a 10 per cent increase in basic rates by the two companies. Carrying out the recommendations, said the statement, would cost the companies about $500,000.

In regard to the Acadia Coal Co., which employs about 1,200 men, the tribunal recommended "that a contract be drawn up embodying the general provisions and conditions (save as to wage rates) of the existing contract between the Dominion Coal Co. and its employees" and also payment of 15c. per shift "on account of war bonus."

In respect to the Old Sydney Collieries, employing some 1,700 men, "the tribunal makes the same recommendation as to the drawing of a contract containing similar provisions to that between the Dominion Coal Co. and its employees."

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To Refire Rock Forge Ovens

The Rock Forge (W. Va.) coal mine and coke ovens, formerly owned by the Connellsville Basin Coke Co., were to be put into immediate operation, according to an announcement on March 22. The property, which is held in the name of Donald D. McCormick, Harrisburg, Pa.,

has been leased to the Henry Clay Coal Mining Co., controlled by A. K. Althouse, of Philadelphia. The lease gives the lessee an option to purchase the property.

Included in the leased property are about 200 coke ovens, in fair condition, and about 2,000 acres of Freeport coal land, together with some mining and preparation equipment. The property has been shut down for about twelve years.

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Arc Welding Interests Large Attendance Of Mining Electric Group

"PRACTICALLY every industry uses arc welding in the repair or fabrication of its product," declared L. G. Pickhaver, welding field engineer, General Electric Co., before the Southern Illinois Mining Electric Group, at its monthly meeting, March 7, at West Frankfort, Ill. The program was sponsored by Machinery & Welder Corporation, St. Louis, Mo.

Continuing, Mr. Pickhaver stated: "Arc welding is a process wherein heat is obtained from an electric arc formed either between an electrode and the base metal, or two electrodes. Either alternating current or direct current may be used. The three main classes are: atomic hydrogen, metallic arc and carbon arc. The latter two may be shielded or unshielded."

The object of shielding the arc is to exclude oxygen from the arc and to form a slag covering over the weld metal while it is cooling. Welds so protected have higher physical properties than where welding is unshielded. Shielding is accomplished either with heavily coated electrodes or by powdered flux along the seam to be welded.

When a.c. welding was first introduced, it had many disadvantages—disadvantages which have since been overcome, but which shelved a.c. welding for a time. As d.c. welding called for heavier currents, arc blow developed in deep corners and grooves, which resulted in inferior welds. It was then that engineers reverted to a.c. welding to overcome the results of arc blow. With the development of transformers and electrodes suitable for a.c. power, the earlier difficulties have been overcome. The poor power factor inherent in a.c. welding has been largely overcome by adding capacitors to the standard welding transformers.

A.C. arc welding, while giving deep penetration with heavy currents, penetrates even less than d.c. currents below 200 amp. This characteristic is of marked advantage in welding thin sheets, for there is much less likelihood that the arc will burn through than if d.c. welded. Alternating current is not a cure-all, but it has its field: heavy framework and thin-sheet welding.

To secure uniform and definite results in manufacturing, a definite welding procedure is worked out and followed. It is customary to determine that procedure experimentally; that is, a following step is not decided upon until its preceding step is completed. Repair jobs do not offer the same opportunity to profit by a worked-out set-up of procedure. In the absence of definite tests to determine the strength of welds, we must make sure physical requirements are ample—perhaps even overdo the job. "In any event we are not completely in the dark, because of data giving minimum physical properties of weld metal and welded joints," Mr. Pickhaver averred. However, to obtain test results, the same procedure must be followed as in making the tests.

The table, Minimum Physical Properties of Welds, gives information on test values of various classes of welds "As Welded" or "Stress Relieved" condition. Classification of welds depends on tensile strength required

Minimum Physical Properties of Welds

	Class of Welding		1	2	3
	Material		Low Carbon Steel, B4A12C or Equiv.	Low Carbon Steel, B4A8 or Equiv.	Low Carbon Steel, B4A8 or Equiv.
Joint	Tensile strength p.s.i.		55,000	52,000	45,000
	Yield point p.s.i.		40,000	40,000	35,000
	Free bend elongation		30%	20%	10%
	Corrosion resistance relative to plate stock		100%	100%	50%
All Weld Metal	Tensile strength p.s.i.		60,000	60,000	50,000
	Yield point p.s.i.		45,000	45,000	40,000
	Elongation in 2 in.		20%	20%	10%
	Density		7.80	7.78	7.75
	Charpy impact ft.-lb		30	20	2
	Endurance limit p.s.i.		28,000	25,000	12,000
	Fillet weld ultimate shear strength in pounds per linear inch	Size			
		¼ in.	.....	11,000	10,000
		⅜ in.	14,000	14,000	13,000
		½ in.	18,000	18,000	16,000
		⅝ in.	21,000	21,000	19,000
		¾ in.	25,000	25,000	21,000
	References		P-102 A.S.M.E. Power Boiler Code	518 A.S.A. Code for Pressure Piping	A.W.S. Fusion Welding and Gas Cutting in Bldg. Const.
			U-68 A.S.M.E. Code for Unfired Pressure Vessels	U-69 A.S.M.E. Code for Unfired Pressure Vessels	U-70 A.S.M.E. Code for Unfired Pressure Vessels

and the material which is to be welded.

"Weld contour is important because it may create stress raisers." Fillets are just as important in making welds as they are in shafting or other finished shapes under stress. Sharp corners will set up concentration of stresses that may cause fracture. Excess metal is worse than useless if it produces a square corner or a notch effect. The correct welding fillet is almost flat with a slight "wash," or fillet, at either side to cause a uniform stress flow from one welded piece to the other. Fig. 1 shows correct and incorrect fillet welds.

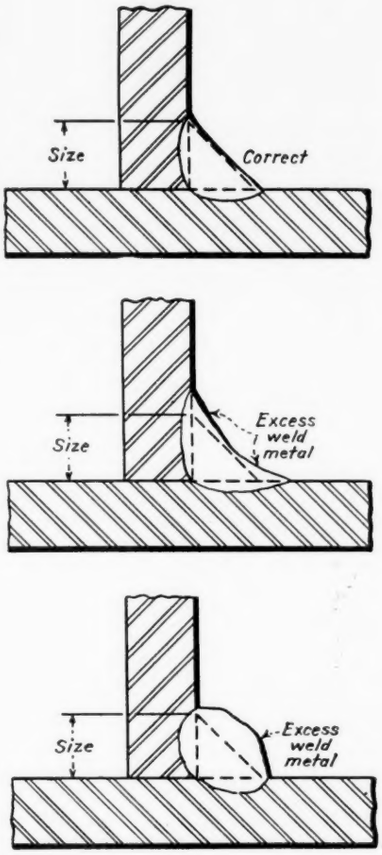
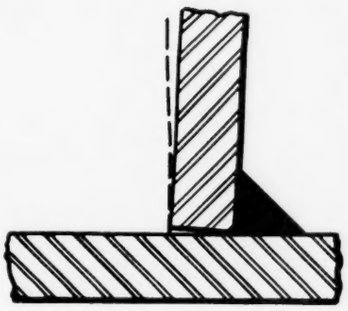


Fig. 1—Correct and incorrect fillet welds.

It is not only important to have smooth, correctly formed fillets but it is equally desirable that stresses from cooling be relieved. Contraction of weld metal causes distortion of welded parts. Distortion means that solid metals flow to a certain extent when stress is applied. Fig. 2 indicates what happens when two sheets of metal are joined by one welded seam, and that a weld on the opposite side tends to draw the plates back to their original position. Distortion may be lessened by clamping the parts to be welded rigidly before welding, or by distorting the parts in the opposite direction before welding. Fig. 3 shows a means of relieving the stress when very heavy sections are to be welded.

Other forms of distortion of welded plates are shown in exaggerated form in Fig. 4. The cracking of plates and other parts that cannot give to the stresses set up is proof of the enormity of those stresses. Stresses



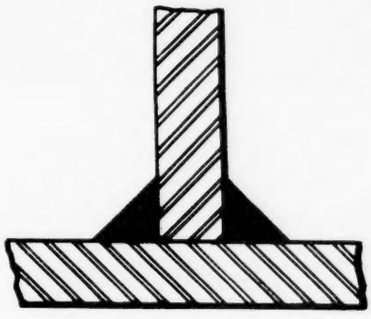


Fig. 2—What happens when two sheets of metal are joined by one welded seam.

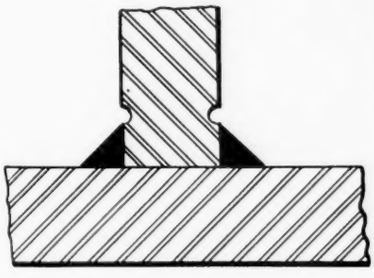


Fig. 3—How stress may be relieved when very heavy sections are to be welded.

Fig. 4—Another form of distortion (somewhat exaggerated).

may be relieved wholly or in part by slow cooling, annealing, peening each layer of weld metal as applied, or by designing welds and structures to permit distortion.

Automatic welding is largely used in manufacturing processes. Mine applications are confined to the building up of shafting and locomotive wheels and axles. Mr. Pickhaver insisted that flaws in automatic welding might be eliminated sometimes by using smaller electrode and at the same time maintain pounds per hour deposit of metal.

Atomic welding is used mainly for certain manufacturing processes where filler metal is not required and for welding nonferrous metals. This is fusion welding, and accurately fitted parts do not require filler metal. For such operations as require filler

metal, it is applied much the same way as in gas welding.

The principle used is to pass hydrogen gas around an a.c. electric arc provided with tungsten electrodes. The arc breaks down the hydrogen molecules into their constituent atoms. This leaves the hydrogen atoms ready to recombine as soon as they have passed from the rending influence of the arc. This is just what these atoms do—go back together, pronto. In the process of recombining, most of the heat the gas absorbed from the arc is given out, melting the metal. An a.c. arc is used because the two tungsten electrodes wear away equally—and very little; about ¼ in. an hour. The hydrogen shields the weld, making possible fusion welds of readily oxidizable metals, as well as thin sheets that would be burned through with the electric arc.

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Tar From Burning Refuse Pile Brings Pollution Problem

Near Hardy, in the Pond Creek district of eastern Kentucky, tar in large quantities flowing from under an old refuse pile estimated to contain at least 2,000,000 tons of material and which accidentally caught fire late last summer, is presenting to officials of the Eastern Coal Corporation, present operators of the No. 1 mine at Hardy and of two other mines in the district, a problem in the solution of which they know of no precedent to follow.

If allowed to flow into the water the tar breaks up into small globules, then is carried downstream and kills all life in the water and along the shore lines. The tar has engulfed earth dams built in an attempt to stop the flow. At present attempts are being made to burn it by encouragement with coal oil. For the most part the refuse of the pile consists of Pond Creek seam bone coal running 20 to 35 per cent ash.

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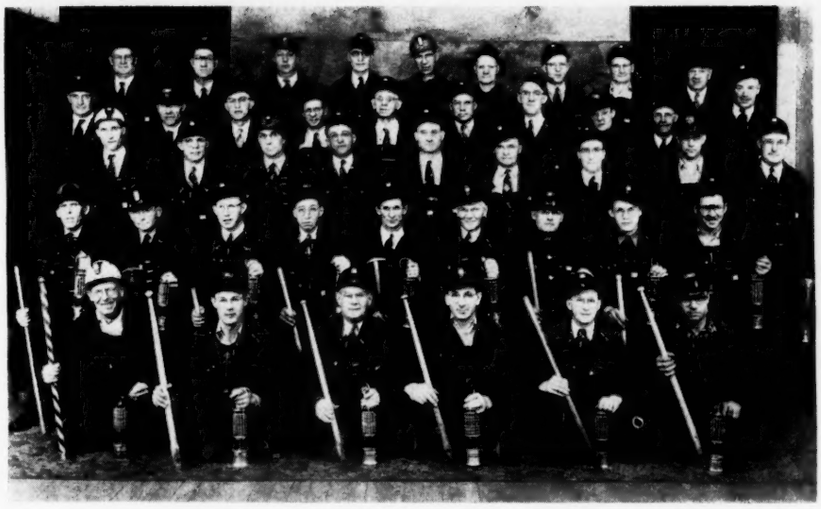
Greek Letter Society Organized For U. P. Safety Officials

A new milestone in coal-mine accident prevention was established on Feb. 27 when the Union Pacific Coal Co. organized at Rock Springs, Wyo., Sigma Tau Epsilon, Chapter No. 1 of the first Greek letter mine safety society organized in connection with any branch of the mining industry in any part of the world. The new society came into existence with 45 charter members, the major number of whom qualified for membership by carrying the mine workers under their supervision for three successive calendar years without a lost-time accident.

The new organization is to be maintained on a definitely democratic basis. Mine superintendents who receive membership will be without voice or vote, and when any unit foreman, outside foreman or mine foreman is promoted he will retain his membership, with, however, loss of voice or vote, and no honorary memberships will at any time be accorded higher staff officials.

The company's mine accident record shows one lost-time accident in its nine Wyoming mines for each 114,700 man-hours of exposure during 1938, 1939 and 1940. This com-



Charter members of new Greek letter mine-safety society

pares with the record of the United States bituminous industry as a whole of 15,000 man-hours' exposure to each lost-time accident.

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Coal-Mine Accident Fatality Rate Down for Soft; Up for Hard

Accidents at coal mines of the United States caused the deaths of 67 bituminous and 20 anthracite miners in January last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production of 43,905,000 net tons, the accident death rate among bituminous miners was 1.53 per million tons, compared with 4.34 in January, 1940.

The anthracite fatality rate in January last was 4.02, based on an output of 4,975,000 tons, against 3.02 in the corresponding month a year before.

For the two industries combined, the accident fatality rate in January last was 1.78, compared with 4.19 in the first month of the preceding year.

Fatalities during January last, by causes and states, as well as comparable rates for the first month of 1939 and 1940, were:

UNITED STATES COAL-MINE FATALITIES IN JANUARY, 1941, BY CAUSES AND STATES

State	Underground: Falls of Roof	Falls of Face	Haulage	Gas or Dust Explosions	Explosives	Electricity	Machinery	Other Causes	Total Underground	Shaft	Open-cut	Surface	Grand total
Alabama	..	..	1	..	..	..	..	..	1	..	..	..	1
Arkansas	3	..	..	..	..	..	..	..	3	..	..	..	3
Colorado	2	..	..	..	..	..	..	..	2	..	..	..	2
Illinois	3	..	..	..	1	..	..	..	4	..	..	..	4
Indiana	1	..	1	..	..	..	..	..	2	..	..	..	2
Iowa	..	..	..	..	1	..	..	..	1	..	..	..	1
Kansas	1	..	..	..	..	..	..	..	1	..	..	..	1
Kentucky	5	..	..	..	..	..	2	..	7	..	..	..	7
Missouri	..	2	..	..	..	..	..	..	2	..	..	..	2
Montana	..	..	..	..	..	..	..	..	..	..	..	1	1
North Dakota	..	..	..	..	1	..	..	..	1	..	..	..	1
Ohio	3	..	..	..	..	..	..	..	3	..	..	..	3
Penna. (bit.)	9	..	3	..	..	..	1	..	13	..	..	1	14
Utah	..	..	1	1	..	..	..	..	2	..	..	..	2
Virginia	3	..	1	..	..	..	..	..	4	..	..	..	4
West Virginia	6	..	5	5	1	1	..	..	18	..	..	1	19
Total bituminous	36	2	12	6	4	1	3	..	64	..	..	3	67
Pennsylvania (anthracite)	9	2	3	1	1	..	..	1	17	1	1	1	20
Grand total	45	4	15	7	5	1	3	1	81	1	1	4	87

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES, BY CAUSES*

January, 1940 and 1941

Cause	Bituminous: Number Killed		Bituminous: Killed per Million Tons		Anthracite: Number Killed		Anthracite: Killed per Million Tons		Total: Number Killed		Total: Killed per Million Tons	
	1940	1941	1940	1941	1940	1941	1940	1941	1940	1941	1940	1941
Underground:												
Falls of roof and coal	58	38	1.290	0.866	9	11	1.601	2.211	67	49	1.324	1.003
Haulage	21	12	.467	.273	6	3	1.067	.603	27	15	.534	.307
Gas or dust explosions:												
Local	3	1	.067	.023	...	1	.....	.201	3	2	.059	.041
Major	91	5	2.023	.114	...	...	.....	.....	91	5	1.799	.103
Explosives	4	4	.089	.091	1	1	.178	.201	5	5	.099	.103
Electricity	4	1	.089	.023	...	...	.....	.....	4	1	.079	.020
Machinery	3	3	.067	.068	...	...	.....	.....	3	3	.059	.061
Shaft	...	...	.....	.....	...	1	.....	.201	...	1	.....	.020
Miscellaneous	5	...	.111	.....	...	1	.....	.201	5	1	.099	.020
Stripping or open-cut	...	...	.....	.....	...	1	.....	.201	...	1	.....	.020
Surface	6	3	.133	.068	1	1	.178	.201	7	4	.138	.082
Grand total	195	67	4.336	1.526	17	20	3.024	4.020	212	87	4.190	1.780

*All figures subject to revision.

De Laval Worm Gear driving Jeffrey car loading conveyor for the Barnes Coal Co.

Permissible Plates Issued

Three approvals of permissible equipment were issued by the U. S. Bureau of Mines in February, as follows:

Jeffrey Mfg. Co.: Type 50-C transfer conveyor; 7½-hp. motor, 230 volts, d.c.; Approval 420; Feb. 1.

Jeffrey Mfg. Co.: Aerodyne Midget blower; 1½-hp. motor, 250 volts, d.c.; Approval 421; Feb. 18.

Jeffrey Mfg. Co.: Aerodyne Midget blower; 1½-hp. motor, 220 and 440 volts, a.c.; Approvals 422 and 422A; Feb. 20.

Adoption of Standards Favored by A.S.T.M.

Action was taken to recommend the adoption as standard of the present Tentative Method of Test for Index of Dustiness of Coal and Coke (D 547-59 T) at a meeting of Committee D-5 on Coal and Coke of the American Society for Testing Materials held March 4 in Washington. This method, first published in tentative form by the society in 1939, measures the relative dustiness of coal and coke when handled. It has proved of especial value in the evaluation of various processes for treating coal and coke in the production of so-called "dustless fuel." Officers of the committee are: chairman, A. C. Fieldner, chief, Technologic Branch, U. S. Bureau of Mines; secretary, W. A. Selvig, senior chemist, U. S. Bureau of Mines.

For many years the committee has sponsored a definition of the term coke which has remained in tentative form because of difficulty in obtaining agreement among various committees of the society. The committee has agreed to withdraw this tentative definition.

Subcommittee VIII on Foundry Coke Specifications has labored for many years in an attempt to revise in satisfactory form the present Standard Specifications for Foundry Coke (D 17-16). These specifications were adopted in 1916 and have outlived their usefulness. Committee D-5 agreed to withdraw the present specifications and to dismiss the subcommittee, thereby discontinuing effort to formulate specifications for foundry coke.

A special section of Subcommittee I on Methods of Testing was formed to consider methods of expressing tolerances on duplicate determinations when analyzing and testing coal and coke. The purpose of this work is to express such analytical tolerances on a precise mathematical basis in terms of probable error, standard deviations, etc. Need for such precise methods of expressing tolerances in duplicate determinations is required in studies now being made attempting to correlate various chemical and physical properties of coal and coke with their use characteristics.

It was agreed to recommend for adoption as standard the present tentative revisions of the Standard Method of Laboratory Sampling and Analysis of Coal and Coke (D 271-40), which pertain to permissible differences in duplicate determinations of volatile matter of coal and coke. Also, it was

agreed to eliminate the note under Sec. 9 which refers to methods of high accuracy in determination of moisture in coal. This note is considered out of date, and, as methods of high accuracy for moisture determination are used only in special research investigations, it is believed best not to complicate the standards by reference to such methods. Action on these two items probably will be deferred until 1942, when the next Book of A.S.T.M. Standards will be issued.

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Pond Creek-Tug River Institute Elects Minns President

At a dinner meeting held at the Mountaineer Hotel, Williamson, W. Va., Feb. 20, members of the Pond Creek-Tug River Mining Institute celebrated the first anniversary of the founding and elected new officers as follows: president, G. E. Minns, general superintendent, Leckie Collieries Co., Aflex, Ky.; vice president, C. L. Yonce, general superintendent, Eastern Coal Corporation, Stone, Ky., and secretary-treasurer, W. A. Eades (reelected), safety director, Eastern Coal Corporation.

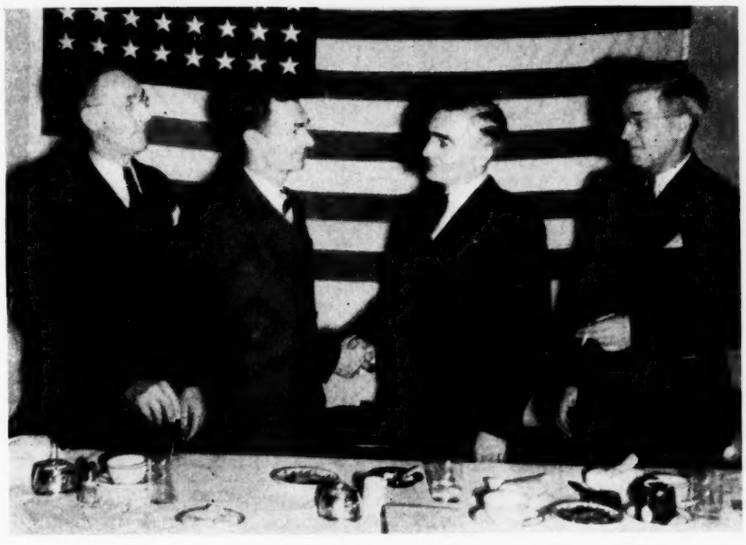
"You are the key men of the organizations for which you work," said the toastmaster and retiring president, E. S. Hamilton, superintendent, Pond Creek colliery, Norfolk & Western Ry. fuel department, and "are charged with the responsibility of preventing accidents." Calling attention to a drop in fatalities to 11 in 1940 compared to 14 in 1939, W. E. Wheeler, senior inspector, Kentucky Department of Mines and Minerals, credited that improvement to the institute. O. W. Evans, a director of the institute and general superintendent and purchasing agent of the fuel department, N. & W., spoke of the "selling," starting with the general superintendent or superintendent, "that is necessary to carry safety into the working place." Ideas gotten from the institute have been carried to his key men, said Mr. Yonce. He warned that a man not interested in safety is not fit to be a section foreman.

Post-Dinner Conversation

Joseph J. Ardigo, secretary, Williamson Coal Operators' Association, and C. L. Yonce, general superintendent, Eastern Coal Corporation.

Taking the chair after his election, Mr. Minns convincingly pledged his best efforts to the institute and said that in its effect on the supervisory force of the Leckie Collieries the meetings have been a wonderful help. The past year, paralleling the first year of institute activity, was the best the Leckie Collieries has experienced as regards fewer accidents. "The place to cut accidents is with your section foremen," and, concluded Mr. Minns, "I hold my section foremen responsible for accidents and I give them credit when they don't have any."

Institute directors elected for the year are L. C. Skeen, Eastern Coal Corporation; W. S. Leckie, Leckie Collieries Co.; O. W. Evans, N. & W.; A. E. Knee, New Alma Coal Co.; J. D. McLaughlin, Earlston Coal Co.; George Baker, Tierney Mining Co.; A. R. Jones, Octavia Coal Mining Corporation; F. L. Long, Emperor Coal Co.; G. E. Minns, Leckie Collieries Co.; E. C. Lewis, Majestic Collieries Co.; Orvalle Copley, Earlston Coal Co.; G. R. French, Alburn Collieries Co.; and E. S. Hamilton, N. & W.



"Congratulations, Mr. Minns"

Left to right: vice president, C. L. Yonce, general superintendent, Eastern Coal Corporation; retiring president, E. S. Hamilton, superintendent, Pond Creek Colliery, N. & W.; president, G. E. Minns, general superintendent, Leckie Collieries Co.; secretary-treasurer, W. A. Eades, safety director, Eastern Coal Corporation.

2,978,000 Tons of Lignite Produced in 1939

Output of lignite in the United States in 1939 totaled 2,978,000 net tons with a mine value of $3,458,000, according to preliminary figures released by William Lane Austin, Director of the Census. Lignite mining operations employed an average of 1,472 wage earners that year, in addition to 115 proprietors and firm members who performed manual work in and about the mines. These worked an average of 203 days of 8.2 hours. Man-hours worked totaled 2,997,000—873,000 at strip pits and 2,124,000 at underground mines.

Production was by 131 companies operating 132 mines, each producing at least 1,000 tons, in the following States: 103 in North Dakota, 17 in Montana, 4 in South Dakota, and 8 in Texas. Reports for 187 additional mines, each producing less than 1,000 tons, showed a total of 75,000 tons. Although there were more than 300 producers in 1939, five companies (four in North Dakota and one in Texas) operating seven mines ac-

LETTERS
To the Editor

Why Not a Coal Man For A.I.M.E. President?

I have noted your recent editorial in which you ask why a coal man should not be selected as president of the American Institute of Mining and Metallurgical Engineers.

Having been identified with both the metal and coal mining industries, this thought strikes a note of interest with me and I am writing to add my approval of the idea. I believe others in the mining industry often do not appreciate the importance of coal. It is the most important of the mining industries in this country, both as regards dollar volume of goods produced and men employed.

It has been said that a good mine is one that will withstand mismanagement. Applying that distinction, there are not many good coal mines, but there are many successful coal properties that have been made good by capable, far-sighted management. Where competition is so keen they must fight harder, employ the most advanced and economical methods, both as regards the mining and their treatment plants. Why not have a toughened and battle-scarred coal-mine executive this time? I believe he would make a good president for the institute. I understand Mr. Eugene McAuliffe has been suggested, and, although I do not know him well, I am sure, from the many reports I have had about him in the coal industry, he would fill the bill excellently. LOUIS WARE, President
International Agricultural Corporation

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Your editorial in the February issue of *Coal Age*, raising the question as to why not a coal man for the presidency of the American Institute, is a very fortunate and timely one, since the coal industry not only fathered the A.I.M.E. but employs the greatest number of men in mining, and the value of its products far exceeds that of any other mineral. It is, I believe, time for the rest of the profession to become acquainted again with one of the best type of men this industry produces. To my mind, Eugene McAuliffe, president of the Union Pacific Coal Co., would be well fitted for this post. He is one of coal's grand men, with a lovable character and a record of achievements in technical matters and human relationships that can well be used as an inspiration to all of us and especially the younger men.

Eugene McAuliffe, during several decades, has served his fellow man, the mining industry, and his profession as few men have, and it is fitting that he be our choice for president in order to honor him for his past achievements and to enable him to use his great wisdom and kindness to render the profession a still greater service.

P. B. BUCKY
School of Mines
Columbia University

Resents Belittling Coal Industry

Striking at the tendency of newspapers and cartoonists to "belittle" the solid-fuel industry, Charles Dallas Reach, president of the Chas. Dallas Reach Co., Newark and New York, takes issue with the New York *Times* for an editorial emphasizing the hardships of hand-firing the furnace. Mr. Reach charged that the editorial was unfair in presenting only "the bad side of solid-fuel heating."

Conceding that the editorial was intended "as a harmless piece of winter whimsy," Mr. Reach declared to *Coal Age* that one seemingly innocuous item such as the *Times* editorial would destroy the impressions created by thousands of dollars worth of advertising which organizations like Anthracite Industries and coal associations had been spending in recent years. He cited as proof of the insidious effect of this type of article the attitude of the dealer who, on reading stories, seeing cartoons and movies, and hearing radio skits about the difficulties of hand-firing, says to himself: "There must be something to this. I'd better hedge and put in oil in case any of my customers buy an oil burner."

Mr. Reach advised that "the destiny of the coal and coke dealer is in the solid-fuel industry. This is the business he knows and this is the business he should fight for and develop. A majority of homes in this country still have solid-fuel furnaces, and the dealer should work with the operators to maintain this market."

counted for about 70 per cent of output. Of the 132 mines with an output of 1,000 tons or more, 95 were underground mines and 37 were strip pits. Strippings employed 29 per cent of the wage earners but accounted for about half of the production. Average man-hour output was 1.637 tons at strip pits, more than double that at underground mines. North Dakota, with 78 per cent of the mines (almost two-thirds strip producers), produced 70 per cent of the total tonnage.

Total payments to wage earners were $1,379,000; supplies and materials cost $343,000; purchased electric energy, $145,000; fuel, $80,000.

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Research Activities Expanded By Koppers Co.

That creation of new and improved chemicals from coal is receiving accelerated attention by Koppers Co., Pittsburgh, Pa., is indicated by the direction taken by the organization's recently expanded research activities at Mellon Institute of Industrial Research and at the company's own laboratories. The research staff has been increased to 67 during the last year and will be enlarged to 101 during 1941. Scientists of national and international repute have been added to the department and others are to join the staff this year. Other long-time members of the staff, some of whom have been engaged in research activities for the company since its inception, are undertaking new projects in their respective fields of specialization, but all these projects are closely related to the conversion of primary coal derivatives into commodities of greater economic value.

The basic purpose of this enlarged research program is to take the company into the production of refined chemical products.

All research activities are organized under the direction of Fred Denig, vice president of the company and director of its research department. Mr. Denig joined the company in 1921 as a chemical engineer and later became a coke-plant superintendent and general superintendent for the company. His experience, both on the scientific and the production side of coal processing, equips him to gear research to actual commercial production in keeping with prevailing world conditions, which are creating entirely new chemical markets within the United States. There are two assistant directors of research: Dr. E. W. Volkman and Dr. A. R. Powell, who went with the company in 1926 and 1923, respectively.

Heading two of the new groups of researchers are Dr. B. B. Corson, engaged in a broad program concerning the preparation and synthesis of useful products from the individual components of coal tar and light oil, and Dr. C. F. Winans, who is carrying on similar chemical and physical investigations in the utilization of coal tar and light oil fractions as sources of needed chemical commodities.

Other groups are headed by scientists who have been with the company for a number of years, among them Dr. W. F. Fair, W. L. Glowacki, Dr. W. H. Hill, J. A. Shaw and H. L. Stewart. Included in their activities are coal-gas products, gas purification, synthetics, tar treatment, and the upgrading of various coal-tar and light-oil fractions by steps such as distillation and crystallization, with the objective of devising processes for making more valuable products from these materials.

There also will be research on the development of agricultural products from coal. The examination of various types of coal to determine their fitness as the source of coke, as well as of coal-tar products, will be continued and expanded, as also will be the basic study of coal carbonization and processing. This coke study is under the supervision of C. C. Russell.

In line with the accelerated trend toward automatic household heating, the Koppers research department recently developed several types of automatic coke stokers. Manufacture of one of these, an underfeed type, was begun late in 1940 by the Bryant Heater Co., Cleveland, Ohio. This device is wholly automatic in that coke delivery from bin to heating plant and ash removal are done automatically. Coke-stoker development is under the leadership of C. E. Shaffer.

Another activity in connection with automatic household heating with solid fuels is a study to determine which kinds and sizes of coal are most satisfactory for domestic coal stoker use. A systematic investigation of factors affecting coal stoker performance is being conducted under the supervision of Walter Knox in a special laboratory set up for this work exclusively. Several types of tests were completed in 1940 and an even more expanded program is under way for 1941.

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Industrial Notes

RAYMOND T. MIDDLETON, manager of mining department sales in the Pittsburgh (Pa.) district for Roberts & Schaefer Co., has been elected a director of the company. The company has added to its line of coal-cleaning equipment the Classifier and Hydrotator process for cleaning fine coals and refuse from existing washeries now being distributed in the anthracite field by the Wilmot Engineering Co., Hazleton, Pa. The Hydrotator Co. has granted to R. & S. the exclusive license for the Classifier-Hydrotator process in the bituminous field. W. L. Remick, formerly with the Hydrotator Co. and Wilmot Engineering Co., will be in charge of and act as contracting engineer for R. & S. in further exploitation and development of this process.

TIMKEN ROLLER BEARING CO., Canton, Ohio, has transferred F. H. Lindus from its Los Angeles office, where he was branch manager, to the home office, where he is engaged in general sales promotion. L. J. Halderman, branch manager of the service-sales division of the Chicago office, has taken Mr. Lindus' place in the Los Angeles office, while Jack Gelomb, formerly Detroit manager of the service-sales division, has filled the Chicago vacancy. Joe Jesseph, resident salesman in the Portland (Ore.) branch, has taken Mr. Gelomb's place in the Detroit office.

CHAIN BELT CO., Milwaukee, has elected J. C. Merwin as president. Formerly vice-president and treasurer, Mr. Merwin suc-

ceeds C. R. Messinger, who died Feb. 4. G. M. Dyke, assistant treasurer, was elected treasurer, and A. F. Kessler, also an assistant treasurer, was elected to the new office of comptroller.

JOHNS-MANVILLE CO. has established a new industrial department office at Atlanta, Ga., to serve the South. Thomas J. Roberts heads the new branch.

CENTRIFUGAL & MECHANICAL INDUSTRIES, INC., St. Louis, Mo., announces that Francis E. Finch, formerly president of Ruggles-Coles Engineering Co. and later vice president of Hardinge Co., Inc., is now associated with it.

MANNING, MAXWELL & MOORE, INC., Locomotive Equipment Division, Chrysler Building, New York City, has appointed Newton P. Selover as western sales manager with headquarters in Chicago. He replaces Robert Watson, who recently resigned. Heretofore he has represented this division on the Pacific Coast with headquarters in San Francisco.

PURCHASING AGENTS' ASSOCIATION OF NEW YORK has elected Thomas I. Savage, of the Murphy Varnish Co., Newark, N. J., as president, vice John D. Leeson. Other officers elected are: Walter E. Cummin, White Laboratories, vice president, and James L. Crosbie, Dexter Folder Co., as a member of the executive committee.

THERMOID CO. (Rubber Division), Trenton, N. J., announces that R. E. Spencer Geare has joined the company, where he will concentrate on belt programs and the expansion of V-belt sales. He has specialized on V-belts, V-belt drives and power transmission for the last ten years.

NATIONAL BATTERY CO., St. Paul, Minn., has appointed H. G. Barnes as vice president and general manager in charge of its Gould Commercial Division, Depew, N. Y. He organized the Motor Power Equipment Co. and the Industrial Credit Co., both of St. Paul, and was president of both until last December, when he resigned to join the National organization.

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis., has promoted Carlton B. Smith to district superintendent of service and erection with headquarters in the Healey Building, Atlanta, Ga. He was formerly Southeastern district service engineer. Lee H. Hill, widely known transformer engineer, has been appointed assistant manager of the company's electrical department.

COCHRANE CORPORATION, Philadelphia, has appointed W. W. Tomes to head the flow meter section. Since graduation from Purdue University in 1928 he has been associated with the Firestone Tire & Rubber Co. in flow measurement and distribution work and, more recently, in meter field engineering and sales work.

STEWART-WARNER CORPORATION, Chicago, has named W. Houlton Blankley as district sales manager of its accessories division. His duties will consist largely of supervising the national accessory servicing training schools conducted by the company's accessory division and aiding in the distribition of its industrial tachometer.

CARDOX CORPORATION, Chicago, has engaged Herbert W. Lange as chief engineer in its fire division. A pioneer in the development of the modern fire extinguisher, he has been with the Underwriters' Laboratories, Inc., since 1926. He will direct engineering activities in connection with bulk carbon-dioxide fire-extinguishing systems and their applications.

LINK-BELT CO. has appointed Harry L. Strube as chief engineer of its eastern division, with headquarters at the Philadelphia plant, to succeed F. F. (Fred) Waechter, who has resigned after 43 years of service. Mr. Strube has been assistant chief engineer at Philadelphia, having begun his Link-Belt service in the engineering department of the Chicago plant in 1910. Subsequently he served as sales engineer, first at Chicago and then in Philadelphia. In 1924 he rose to the position of manager of vibrating screen sales, and in 1934 was made assistant chief engineer. Mr. Waechter started his Link-Belt career in 1898 in the company's Philadelphia plant engineering department.

ROBINS CONVEYING BELT CO. has appointed Andrew Hutton as works manager of the company's Passaic (N. J.) plant. He will be in charge of all manufacturing operations. He was recently chief engineer of the Davis Engineering Corporation, Elizabeth, N. J., and was previously vice president and general manager of the Taylor Mfg. Corporation, Milwaukee, Wis.

HERCULES POWDER CO., Wilmington, Del., has advanced Edward B. Morrow from assistant treasurer to treasurer and a member of the executive committee. He succeeds Charles C. Hoopes, who will continue as a director and member of the finance committee. Francis J. Kennerley, comptroller, has been elected an assistant treasurer. He will continue as comptroller.

ROLLER-SMITH CO., Bethlehem, Pa., has made Paul Helms purchasing agent, effective April 1, upon the resignation of Harry A. Cassler, who held that position for the last 20 years. Mr. Helms joined the organization in 1926 as an inspector, and a year later was transferred to the production department, where he remained until appointed assistant production manager in 1930. After a year he was placed in charge of stores and receiving, which position he held until appointed assistant plant manager. He became assistant purchasing agent in 1939.

DURALOY CO., Scottdale, Pa., has elected Harvey T. Harrison as vice president in charge of sales. Joining the company in 1928 in the New York office, he became district manager at Cleveland in 1930, remaining until 1937, when he became general sales manager. Charles H. Hoefer has been made general superintendent. He was formerly superintendent of the alloy division, Lebanon Steel Co., and also superintendent of the Forging & Casting Corporation division of the Allegheny Ludlum Steel Co. and Empire Steel Castings, Inc.

GISHOLT MACHINE CO., Madison, Wis., has appointed the Mine & Smelter Co., Denver, Colo., as its exclusive sales agent in the Rocky Mountain region.

LAMINATED SHIM CO., INC., Glenrock, Conn., has named E. B. Nisbet, formerly purchasing agent and treasurer, as execu-

tive vice president. E. R. Young, formerly factory manager, steps into an enlarged portfolio as the new vice president in charge of production. Richard Seipt, sales manager, has also been appointed vice president in charge of sales.

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Hanna Preparation Facilities Being Expanded

An addition to preparation facilities is being installed at the Piney Fork mine of the Hanna Coal Co., Piney Fork, Ohio. This addition will consist of a Link-Belt Simon-Carves washery designed to clean 300 tons of 0x6-in. coal per hour. The cleaning equipment will consist of two No. 5044 Simon-Carves wash boxes; 0x⅜-in. coal will be dried in an Elmore centrifuge; ⅜x1¼-in. coal will be dried in thermal drying units of the screen type manufactured by Link-Belt Co. The water-clarification system will consist of a concrete sludge tank.

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Heaters Burn High-Volatile Coal Without Smoke

Smokeless combustion of high-volatile coals is an urgent problem in the Middle West, especially in the St. Louis area. A type of heating stove and of hot-air furnace designed with this end in view, however, has been sponsored by Southern Illinois Coals, Inc.

The combustion chamber in each is divided into two parts by a partition, and fresh coal is fed into one side, which is empty, while a brisk fire is burning on the other. The side which is filled with fresh coal is covered with a tight lid, and when the coal becomes hot the gases pass down to and through an opening connecting the two parts and up through the hot fire, where gases and smoke are consumed. When the coal on this side is reduced to ashes, these are dumped and replaced by fresh coal, over which the lid is thrown. Thus the gases and smoke of this coal are carried through the coal on the other side, which by this time is extremely hot.

Experiments made by H. Kuenzel, assistant professor at Washington University, St. Louis, of this—the DeWitt device—in a 22-in. furnace showed that only once in the entire test was there No. 2 Ringelman smoke and then only for 15 to 30 seconds. This occurred when the coked charge was set to burning and the burned-out side was recharged. After that, during and immediately after charging periods, no smoke denser than No. 1 showed at the stack. Even this faded out to a slight haze, usually at the end of 20 minutes. Coal from Energy No. 5 mine of the Franklin County Coal Co., 3x2-in. size, was used in the test. It is claimed for the stove that it needs filling only once in 24 hours and that it gives an even heat with maximum economy.

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Republic Rehabilitates Ovens

Republic Steel Corporation is rehabilitating 100 beehive coke ovens at its Virginia mines, near Bessemer, Ala., and expects to have them ready for operation in about a month. There are 301 of these old ovens, which were abandoned in 1918, when the property was owned by the Gulf States Steel Co., merged with the Republic company about ten years ago. Republic has been rehabilitating the Virginia mines and expects to have them ready for production in two or three months. In the meantime, when the ovens are ready for operation, it is expected to supply the coking coal from the Sayreton mine of the company. H. M. Johnstone, superintendent of the Sayreton mine, will have charge of the Virginia operation also.

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Pryor Leads Colorado Mines In Safe Operation

Pryor mine of the Pryor Coal Mining Co., near Walsenburg, Colo., led the coal mines of the State in safe operation during the second half of 1940 with a record of 9,036 working shifts per accident. Runner-up was Crested Butte mine of the Colorado Fuel & Iron Corporation, with 7,319 working shifts per accident.

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Okehs Mount Hope Safety Station

Proposed establishment of a safety station at Mount Hope, W. Va., has been approved by Dr. R. R. Sayers, director of the U. S. Bureau of Mines, according to an announcement on March 5 by Representative Edmiston (D., W. Va.). Mr. Edmiston said he felt it would be a means of curtailing accidents and deaths in West Virginia mines, adding he would ask the House for an annual appropriation of $25,000 to maintain the station.

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Fire Destroys Pageton Tipple

Pageton Pocahontas Coal Co.'s tipple at Anawalt, W. Va., was destroyed by fire believed to have been started from defective wiring on March 11. The structure was all wood with a capacity of about 750 tons daily. Several railroad cars loaded with coal as well as coal in the structure were burned.

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Suffolk Colliery Worked Out

After more than 80 years of activity, operations were suspended on Feb. 6 at the Suffolk colliery of the Philadelphia & Reading Coal & Iron Co., Mahonoy City, Pa. The colliery was originally opened in 1860 and, except for minor interruptions, had been operated continuously ever since. At the time of the suspension the reserves in the area assigned to the colliery were practically exhausted, output last year having dropped to less than 125,000 gross tons.

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Plateau Acquires Idle Plants

The Plateau Coal & Coke Co., recently organized in Birmingham, has acquired the properties of the Yolande Coal & Coke Co., at Connellsville and Yolande, in Tuscaloosa

County, Alabama, including developed mines and coke ovens of the beehive type. Fifty of these ovens are at Connellsville and 100 at Yolande, all of which have been out of commission for about 20 years. Fifty of the ovens are being rehabilitated and part of them are in operation, and the rest will be refired as rapidly as reconditioned.

Coal for the ovens is being obtained from an opening in the Blue Creek seam on the properties, and is being blended with other coal to produce primarily a foundry product, which is actively in demand and short of requirements at present.

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A.S.T.M. Standards Supplement Issued for 1940

To keep up to date its triennially published Book of Standards, the American Society for Testing Materials in the two intervening years issues supplements to each part of the book. The 1940 Supplement, issued in three parts, gives in their latest approved form 292 specifications, tests and definitions which were either issued for the first time in 1940 or revised.

Part I, on metals, with 100 standards, covers about 500 pages including 48 specifications covering ferrous metals, 49 specifications pertaining to the non-ferrous field, and three general testing methods. Part II includes 91 standards and comprises 350 pages covering the non-metallic materials used for construction purposes.

Part III, the largest volume, covers the following materials: coal and coke, petroleum products and lubricants, electrical insulating materials, plastics, rubber products, textile materials, paper, etc.

Copies of these supplements can be obtained from the A.S.T.M. headquarters, 260 South Broad St., Philadelphia, Pa., at $3 for any one part, $5 for any two parts, and $7 for all three parts; each cloth bound. Half-leather bindings are available upon additional payment of $1 per part.

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Trade Literature

AUTOMATIC SWITCHGEAR — Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Descriptive Data 31-340, with the aid of wiring diagrams, describes the application of automatic switchgear to substations furnishing power to the mining industry. The specifications covering switching arrangements for single- and double-unit stations are listed. Operation and distinctive features are discussed.

BRONZE VALVES—Manning, Maxwell & Moore, Inc., Bridgeport, Conn. Bulletin featuring Hancock superfinished "500 Brinell" bronze valves describes the application of the superfinish operation to the manufacture of such units. Also tells about the recently developed Hancodur stems and bonnets used in these valves.

CORD CONVEYOR BELT—B. F. Goodrich Co., Akron, Ohio. Catalog section points out where a cord conveyor belt is needed, details its construction features and recites the major advantages which this product has over the older, conventional construction. Among advantages cited are resistance to impact, natural troughing, low stretch and flexibility.

D. C. MOTOR CONTROL—General Electric Co., Schenectady, N. Y. GEA-3531 explains how to select control for d.c. motors in simple language; selection chart is included.

DIESEL-ELECTRIC UNITS—Caterpillar Tractor Co., Peoria, Ill. Booklet Form 6344 gives detailed description of diesel engine and self-regulating generator, also listing, discussing and picturing more than a score of different kinds of installations.

DIESEL ENGINES—Caterpillar Tractor Co., Peoria, Ill. Form 5850 presents detailed discussion of mechanical features and manufacturing methods. Form 6570 explains how diesel engines can be applied to a wide variety of power needs. Form 6537 tells how the problem of low-cost, dependable standby power has been solved by the medium-speed, heavy-duty diesel engine.

FRICTION MATERIALS — Johns - Manville, New York City. Brochure Form FM-7A contains comprehensive data on complete lines of industrial brake linings and blocks and clutch facings for all types of industrial equipment. A chart simplifies selection of the most suitable friction material for any specified service.

HARD-FACING RODS—Dymonhard Corporation, New York City. Booklet lists features and uses for Dymonhard products, including guide for selecting the proper rod for every wear-resistant purpose.

MAGNETIC STARTER—General Electric Co., Schenectady, N. Y. GEA-841K describes features and advantages of the CR7006-D40 full-voltage starter for induction motors.

PARKWAY CABLES—John A. Roebling's Sons Co., Trenton, N. J. Catalog J-862 covers origin, development and uses of metallic and non-metallic Parkway cables.

PIN-TYPE INSULATORS—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Descriptive Data 39-180 discusses radio interference-proof insulators with ratings between 95 and 200 kv. Multipart, one-piece and bullet-resistant designs are described, with a note on pinhole and post-type units.

REDUCTION DRIVE—American Pulley Co., Philadelphia, Pa. Catalogs R-41, on "American" reduction drives, and W-41, on "American" wedgbelt drives, are said by the manufacturer to supply all information necessary to lay out a complete drive.

RING CRUSHER—American Pulverizer Co., St. Louis, Mo. Booklet cites features and advantages of the Type "S" improved American ring crusher, giving test data and sectional views.

SAFETY LADDERS—Duo-Safety Ladder Corporation, Oshkosh, Wis. Folder Form 47A, on wood ladders, and folder Form F-411, on duralumin units, stress safety features of Duo-Safety units.

SHOVEL-CRANE UNITS—Link-Belt Speeder Corporation, Chicago. Catalog 1885 points out features of the 2- to 3-cu.yd. Speed-O-Matic Series "500" shovels, draglines, cranes, including welded unit construction; interchangeable crawler side frames; self-guiding non-clogging treads; self-aligning rotating rollers and center pin bearing; high ground clearance; and great capacity, ease and speed of handling resulting from the machine's hydraulic power control.

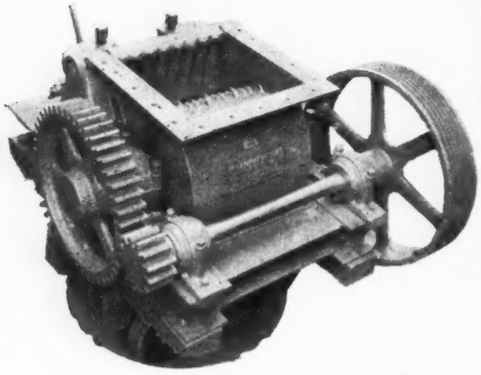
SPEED VARIATOR—General Electric Co., Schenectady, N. Y. GEA-3517 describes new G-E speed variator, an all-electric adjustable-speed drive operating from a.c.

SWITCHGEAR RECTIFIERS — Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Descriptive Data 31-350 describes automatic switch-gear rectifiers rated up to 550 volts and 600 kw. for mining service. Descriptive Data 31-355 covers partially automatic switchgear control for rectifiers in mining service.

SYNTHETIC RUBBER—Hydrocarbon Chemical & Rubber Co., Akron, Ohio. Booklet relates how the Hycar type of synthetic rubber is handled like natural rubber, describes the physical characteristics of Hycar O. R., and oil-resistant type of synthetic rubber, lists the comparative properties of Hycar O. R. and natural rubber and pictures some of the steps in the manufacture of Hycar.

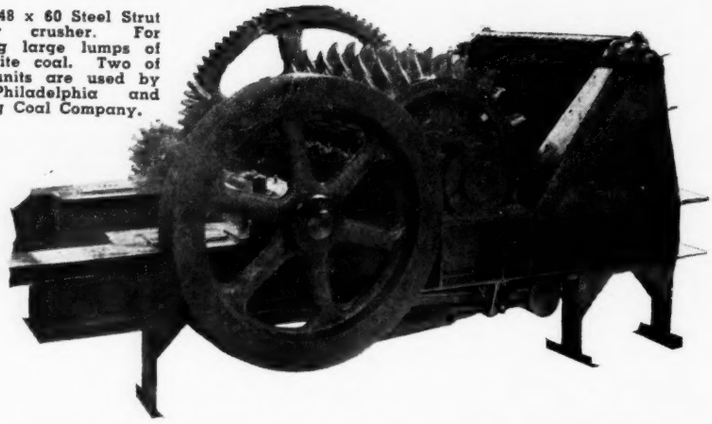
TAMPING—California Cotton Mills Co., Oakland, Calif. Folder stresses advantages in safety and economy of Calcot tamping.

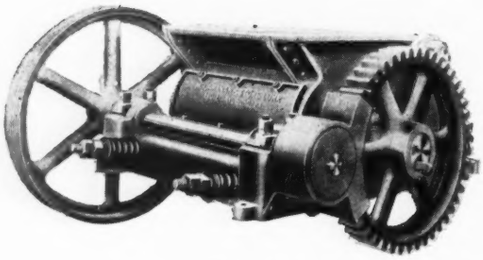
TREATMENT FOR BITUMINOUS COALS—Solvay Sales Corporation, New York City. Booklet contains information concerning overcoming by the use of Procite such difficulties with bituminous coals as clinkering, tube slagging, corrosion, coke spars, lowering of danger of spontaneous combustion and lessening of freezing hazard.



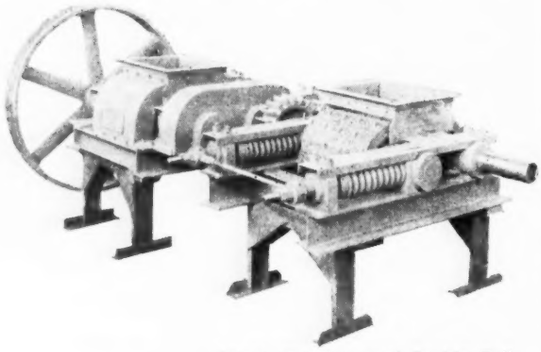
Above—All steel Black Diamond crusher, roller bearing equipped. Quick adjusting—low headroom—automatic steelstrut tramp iron protection.

Right—48 x 60 Steel Strut primary crusher. For cracking large lumps of anthracite coal. Two of these units are used by the Philadelphia and Reading Coal Company.

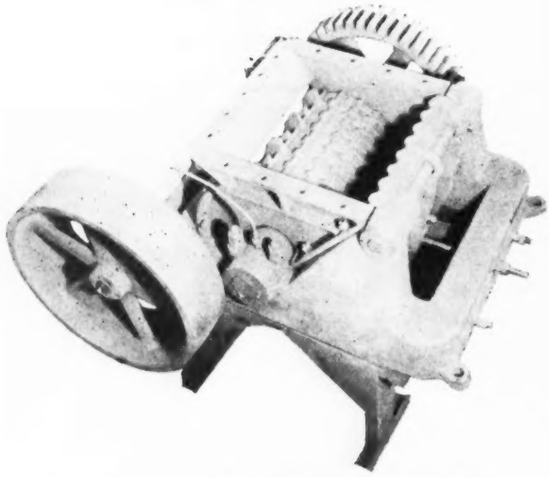




Above—A single Bolt Adjustment General Utility Black Diamond Crusher, equipped with springs on adjustment rods and shear pins in pulley for protection.



Above—Two all steel Double Roll coal crushers, as used by the Duke Power Company.



Above—The New Bantam Buster—A low cost unit especially designed for use at truck mines and low capacity operations.

WHAT'S NEW IN COAL-MINING EQUIPMENT

SYNTHETIC RUBBER

After experiments and tests extending over several years, Goodyear Tire & Rubber Co., Akron, Ohio, announces its ability, with the aid of a period covered by reserves of crude rubber, to get under way large-scale production of Chemigum, a synthetic rubber. According to the manufacturer, Chemigum resembles in physical appearance the grade of rubber known as brown crepe; it is quite tough and has a rather distinctive odor. Important advantages claimed for it include increased tensile strength, resistance to aging, abrasion and oils, and the fact

that it processes easily. Besides being more resistant to oxidation than natural rubber it is said to be less soluble in conventional rubber solvents. It has been used in the manufacture of gasoline hose and nozzles, thermostat gaskets, hydraulic press pads, valve and pipe gaskets, and automobile tires. Though at present it costs more than natural rubber, the company says it gives promise of approaching the cost of natural rubber if produced on a large scale.

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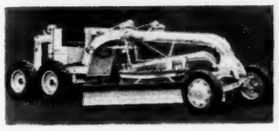
MOTOR GRADERS, TIE CAR, TRANSFORMER

Allis-Chalmers Mfg. Co., Milwaukee, Wis., offers a new motor grader weighing 21,500 lb.—Model AD—designed for heavy grading, bank cutting and ditching. High earth-moving capacity is attained through more clearance under the front axle and circle, permitting the full



volume of dirt to roll off the blade without hanging in the axle or circle, thus absorbing engine horsepower, decreasing travel speeds and increasing fuel consumption. The "Hi-arch" front axle has 22 in. of clearance and there is 6¾ in. of clearance between the "Roll-away" blade and the circle.

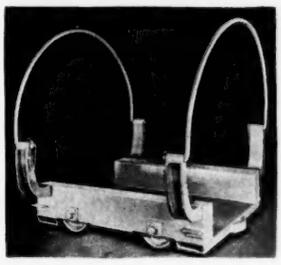
Power is supplied by a General Motors 2-cycle diesel engine developing 75 brake horsepower. The transmission features short, heavy shafts and carburized and hardened gears for long- trouble-free service. It has a range of six forward and three reverse speeds.

The A-C W-Speed Patrol, a new motor grader, is said to have many applications in coal stripping. It can be used to clean up after the stripping shovel by blading the remaining material into windrows for loading into trucks. Then with the sweeper attachment, which consists of a revolving broom sweeping a 72-in. swath, the coal can be swept clean. Mounted on rubber pneumatic tires, it does not gouge or tear up the coal while working on it.

The 120-in. wheelbase and short turning radius make maneuvering

in close quarters easy. Operated by one man and burning about a gallon of gasoline per hour, this unit is economical to operate. It weighs 5,960 lb. and has 26 drawbar hp. Standard equipment includes a 10-ft. moldboard, muffler, and electric starting and lights. A nine-tooth scarifier, ripping a 37-in. swath, is available mounted at the same points as the moldboard. The Hough sweeper does not interfere with the performance and is easily attached or detached.

A.-C. also presents a newly improved, all-welded tie car for standard 8-ft. wood-preserving pressure cylinders. The car is built on standard-gage track and is equipped with Timken roller bearings. The car is designed for maximum possible loading



capacity and for minimum waste of treating space inside the pressure cylinder.

Allis-Chalmers Mfg. Co., Pittsburgh, Pa., offers a new distribution transformer for which it claims these features: (1) Cadmium-plated three-way terminal that cuts installation time, simplifies wiring job and minimizes electrolytic action on copper or aluminum conductors; (2) new durable steel tank, tested under pressure, which prevents oil leakage; (3) spra-bonderizing, plus triple-coat automobile finish, which gives positive four-way rust protection; (4) double conductor insulation, providing double safety against winding failures; (5) core and coil construction designed for years of efficient service-free operation; (6) extra heavy porcelain coordinated bushings with liberal creepage, offering maximum reliability under fog, dust, chemical or other adverse operating conditions.

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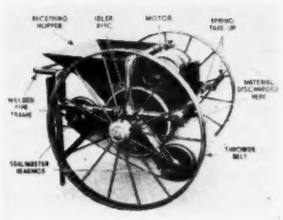
LOADER AND PILER

Stephens-Adamson Mfg. Co., Aurora, Ill., announces that important improvements have been made in the construction of its loader and piler, including: All loaders are now equipped with Sealmaster permanently sealed, self-aligning, prelubricated ball-bearing units. Because of the dusty conditions under which these machines normally operate in loading bulk materials into box cars and piles, this is said to assure minimum maintenance



attention and maximum power savings.

A new, simplified means of adjusting the alignment of the belt has been adopted. The loader operates with a fast-moving dished belt. To facilitate adjustment of this alignment, a screw control now protrudes from the bearing through the front of the loader frame, so that to move the bearing forward or backward and thereby adjust the alignment, it is necessary only to turn this control to right or left with an ordinary wrench. The pipe frame of the loader has been streamlined.

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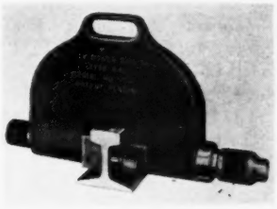
RAIL PUNCH AND CABLE SPLICER

New additions to the line of velocity-power tools of the Mine Safety Appliances Co., Pittsburgh, Pa., are a rail punch and a cable splicer. The rail punch is a self-contained portable tool for punching holes for track bolts and rail bonds. With proper punch and die installed, the punch is placed at the desired



location on rail, and a hand-firing hammer discharges a small blank cartridge in the breech unit and drives the punch through the rail web. The finished hole is said to be clean, smooth, free of burrs and with practically no taper. The punch is compact and readily portable, weighing only 42 lb. and measuring about 9½x16½x4½ in.

The cable splicer is designed for making repairs on all types of mining-machine cables safely, effectively and with expenditure of minimum time and effort. Weighing only 6 lb. fully assembled, it is operated by cartridge discharge, the unit compressing a copper sleeve tightly about the

two butted ends of a broken cable, giving a splice of small diameter which allows application of full insulation. The short connection does not impair flexibility of the cable and gives full current-carrying capacity and high percentage of mechanical strength.

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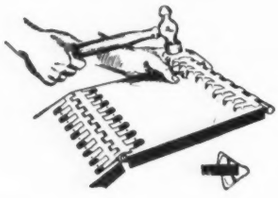
BELT LACING

To meet a long-felt need in the belting trade for a belt lacing suitable for a ⅝-in.-thick belt 8 in. wide, Armstrong-Bray & Co.,



Chicago, announces No. 45-T Steelgrip lacing, packed in boxes containing four sets. This is a new size of the No. 45, heretofore packed only in standard 12-in. boxes.

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TRUCKS, TRACTORS AND SIX WHEELERS

Mack Trucks, Inc., Long Island City, N. Y., announces production of two new truck models, the LF and LJ; three new tractor models designed exclusively for tractor service—LFT, LHT and LJT—and three six wheelers, the LF, LH and LM.

The LF truck is powered by a six-cylinder model EN 405 Mack

Thermodyne engine developing 118 hp. at governed speed of 2,500 r.p.m. Torque developed is 300 lb.-ft. at 1,000 r.p.m. The LJ truck, LFT tractor and LF six wheeler are powered by a six-cylinder model EN 457 Mack Thermodyne engine. The LHT tractor, a unit designed particularly for hauling heavy train loads, is powered by the model EO Thermodyne engine, as also are the LH and LM six wheelers.

All of these Mack Thermodyne engines are of similar design. Crankshafts have seven main bearings, are fully counterbalanced on every throw, and are drop-forged, case-hardened, low-carbon steel. Cylinders are chrome-nickel alloy semi-steel heat-treated and are cast in block with two detachable heads.

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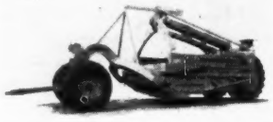
SCRAPERS

Designed to give increased yardage with D8 tractor power, R. G. LeTourneau, Inc., Peoria, Ill., has introduced the Model LU Carryall cable-controlled scraper with a struck capacity of 15 and a heaped capacity of 19 cu.yd. This model can be used behind the standard D8 tractor and loaded either with or without a pusher. An 8-ft. 6-in. blade width permits moving the scraper over highways and its operation on narrow fills.

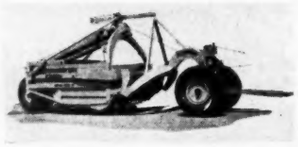
The patented double-bucket feature incorporated in the new model gives the effect of loading two small Carryalls successively. After the first bucket is loaded



to capacity it is permitted to travel back on rollers instead of being forced, thus reducing loading resistance and giving larger possible loads for extended tractor effort. The second or front section of the bowl is then easily heaped high with the D8 tractor power. High sides retain the material that would otherwise "boil" over and be lost by downhill or pusher loading. A new apron design increases capacity, reduces overflow and facilitates loading by reducing entrance friction.

Positive wipe-out ejection tailgate gives accurate control of spread, eliminating the necessity for secondary spreading tools, and empties the bowl completely and quickly of the stickiest materials.

The company also has developed the Model LP Carry-



all scraper, replacing the Model P, for use behind the D8. Struck capacity is 12.1 cu.yd., and heaped 15. Features of the new model include apron cable deadended for long cable life; new apron design for increasing capacity, reducing overflow and facilitating loading by reducing friction; and a new overhead traveling sheave assembly which keeps dirt out of the sheave and lengthens cable life. In addition to these innovations the Model LP incorporates positive ejection and regulated speed, controlled cutting, 8-ft. 6-in. cutting edge, tailgate cable pull at load center, and box-beam arc-welded construction for great strength and light weight.

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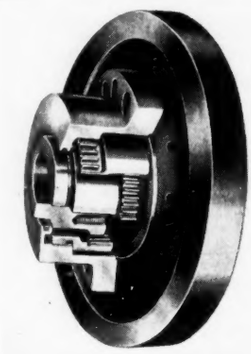
FLEXIBLE COUPLING

To save space and at the same time secure full flexibility the Manger flexible coupling has been developed by Farrel-Birmingham Co., Inc., Buffalo, N. Y. For connecting a shaft directly to a flywheel, brake drum or flange this unit provides complete flexibility with about one-half the axial clearance required by some other types of couplings. Moreover, the dummy, pilot or stub shaft is eliminated.

The Manger unit, it is said, is equally applicable for connecting two free-ended shafts in combination with a solid flanged half coupling, which gives a remarkably close-coupled connection. When two units are coupled to a single driver with this coupling it is possible to operate one unit by unbolting the coupling and drawing back the outer sleeve on the unit which is not to be used. As the hub on the driver is solid, there are no loose parts to interfere with the free rotation of the driving shaft.



In connecting shafts of different diameters, the Manger coupling, or flexible member, is mounted on the smaller shaft. As the size of the flexible member is determined by the size of the smaller shaft, a smaller and lower priced coupling can be used.

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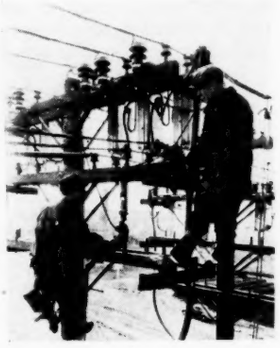
PHASING-OUT VOLTMETER, D.C. MOTORS

A new portable 15-kv. high-resistance voltmeter for approximate indications of voltage is offered by General Electric Co., Schenectady, N. Y., for higher voltages than those now handled by a similar G.E. 5-kv. voltmeter. Designed particularly for phasing out power-distribution cir-



cuits, these instruments are said to be also suitable for bus sectionalization, location of cable faults and similar applications.

For use on 6,900- and 12,000-volt circuits, the new voltmeter has a scale marked 0-15 kv. and is constructed to withstand 30 kv. momentarily, since this voltage may be experienced when phasing out 15-kv. circuits. When used for phasing-out service the instrument will show approximately 0 voltage if the correct phase relationship is obtained, or will go off-scale, indicating an improper connection.

Basically, the phasing-out voltmeter consists of a miniature instrument connected in series with a ¼-watt neon lamp and two high-voltage resistors, properly treated to maintain stability under varying atmospheric conditions. A transparent plastic tube completely incloses all of the parts. The indicating instrument is a rectifier-type milliameter.

Compactness and improved protection are said to be two outstanding features of a new line of d.c. motors recently announced by G. E. A new design of rolled-steel frame and improvements in end-shield and bearing - bracket construction combine to give the new motors excellent protection from exter-

ARE CABLE FAILURES DRIVING YOU NUTS?

Are oil-rotted motor leads quitting on you and tieing up production? Are heat and vibration drying, cracking and short-circuiting stator leads and the grid-baked connections between controllers and starting resistors? Are arc-fires travelling along the insulation? Are you hopping from one rewiring job to another *and then going back to do the same thing all over again*?

If that's your situation don't blame operating conditions that you can't change. What you need is a cable designed especially for severe service in cutters, loaders and locomotives—one that will prevent breakdowns, equipment outage, lost production and unnecessary maintenance expense! And that's just what you'll get if you rewire with Rockbestos A.V.C. Mining Cable because it is permanently insulated *with asbestos* against the tonnage-reducing failures caused by heat, oil, grease, fire, moisture, overloads and vibration.

Keep your equipment working full-time and cut production costs with Rockbestos A.V.C. Mining Cable. It is heatproof, fireproof, moisture-proof, vibration-proof and will always remain *permanently flexible*. Easily installed without forcing or roughing the braid because the diameters are made to the manufacturers bushing sizes. Insist on the original. It has the name—ROCKBESTOS A.V.C.—lettered in white all along the braid.

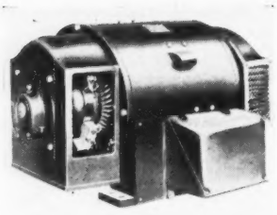
The Original Rockbestos A. V. C. gives you these Ten Tested Values

1. HEATPROOF
2. FIREPROOF
3. PERMANENT
4. Reduces Equipment Maintenance Costs
5. Resists Heat and Vibration
6. Fits Bushings
7. Oil Grease and Moisture Resistant
8. High Overload Capacity
9. Permanently Flexible
10. Long Service

For sizes, diameters and weights refer to McGraw-Hill Coal Mining Catalogs, or write to Rockbestos Products Corporation, P. O. Box 1102, New Haven, Conn., for Bulletin 30-C and a sample.

These jobbers carry genuine Rockbestos A.V.C. Mining Cable in stock

BECKLEY, W. VA.:	Beckley Mach. & Elec. Co.	EVANSVILLE, IND.:	Evansville Elec. & Mfg. Co.	MIDDLESBORO, KY.:	Rogan & Rogan Co.
BIRMINGHAM, ALA.:	Moore-Handley Hdwe. Co.	FAIRMONT, W. VA.:	Fairmont Supply Co.	PITTSBURGH, PA.:	Upson-Walton Co.
BLUEFIELD, W. VA.:	Superior-Sterling Co.	HUNTINGTON, W. VA.:	Banks-Miller Supply Co.		Westinghouse Elec. Supply Co.
CLEVELAND, OHIO:	Upson-Walton Co.	LOTHAIR, KY.:	Mine Service Co.	SCRANTON, PA.:	Penn. Elec. Engineering Co.
				WILLIAMSON, W. VA.:	Williamson Supply Co.



nal damage. The use of Formex wire coils and a specially developed Glyptal insulating varnish provide high resistance to impact, abrasion and the action of foreign materials. The motors can be furnished with sleeve or ball bearings.

Open motors are available in constant-speed ratings from ½ hp. at 850 r.p.m. up to and including 60 hp. at 1,750 r.p.m., and in adjustable-speed ratings from ½ hp. at 850/3,400 r.p.m. up to and including 15 hp. at 500/1,800 r.p.m. Motors in the larger ratings (beginning at 50 hp. 850 r.p.m.) embody additional design innovations such as a new system of self-ventilation, extra protection of all current-carrying and rotating parts, and large conduit boxes. New V-type double brush holders give better commutation and permit rotation in either direction, and a new type lifting lug facilitates handling.

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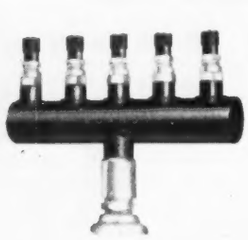
CABLE CONNECTOR, LINE CONNECTOR

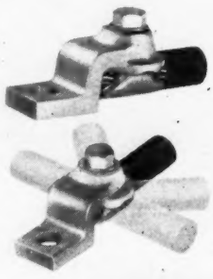
Burndy Engineering Co., New York City, offers the Type ZMDZ insulated stud connector for joining several cables to smooth or threaded stud. The cables are each gripped by compression cone clamping elements and the stud also is gripped by a compression cone suitably threaded to screw onto the stud.



Insulation of the connector is completed by taping the exposed metal parts or insulating sleeves can be furnished which eliminate the necessity of taping.

This connector is said to be especially suited for stud connections in underground distribution systems, at network protectors, or on the secondary terminals of underground transformers. It is available for joining various sizes and numbers of cables.

To make cable connections easier and to reduce costs, Burndy has introduced a new idea in electrical connectors known as the Type EA "Versilug." The new element is a rotatable cable clamp; conductors can be joined to the connectors at any angle. Each size accommodates a range of conductors and only six sizes



are necessary to take conductors from No. 8 stranded cable to 1,000 MCM.

The connector body is made of high-conductivity copper alloy, while the clamping eye is made of high-strength bronze. High-strength Everdur bolts are used to obtain high clamping pressures. There are no exposed threads. The conductor is completely surrounded and gripped tightly by the connector eye and the cable strands are fully protected.

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FLASHLIGHT EXTENSION

A handy device for projecting light to difficult-to-get-at places in mines and machine departments, known as the Sierra flashlight bulb extension, has been developed by the Sierra Aircraft Co., Sierra Madre, Calif. Made in lengths from 6 to 36 in., the extension has a plug which will screw into any flashlight with the bulb in the opposite socket. With this extension it is possible to make inspections in crevices and between closely adjacent rock formations where it is difficult to project the light from an ordinary bulb or flashlight. Being flexible, it can be fashioned into a stand for itself and set in position so that both hands are free to work.

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POWER PLUGS AND SOCKETS

Howard B. Jones, Chicago, offers a new line of power plugs and sockets known as the 500 Series. Made in 2, 4, 6, 8, 10 and 12 contacts, they are designed for 5,000 volts and 25 amp. All sizes are polarized so that it is impossible to make incorrect connections, even when using several sizes on a single installation.

The cap is so arranged that a standard cable clamp can be used; connections are easily and quickly made, it is said, and cap body can be removed for inspection without disturbing wiring. The design of the unit prevents the fingers from coming in contact with the prongs while they are still in contact with the socket terminals, preventing the possibility of shock or injury. With the trend toward high-speed production, designers of electrical equipment eliminate the loss of time and money by interconnecting component parts with plugs and sockets.

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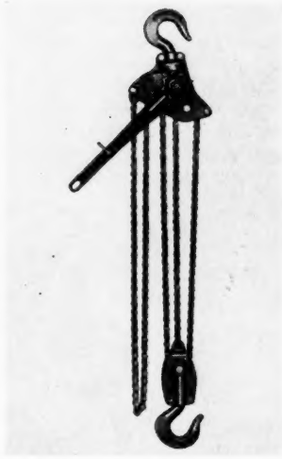
PORTABLE HOIST

The Philadelphia division of the Yale & Towne Mfg. Co. announces a new addition to its line of "Pul-Lift" portable hoists. The new hoist has a capacity of 4½ tons, is light in weight (about 75 per cent less than conventional equipment), making it easily portable, yet is strong enough to more than adequately care for the jobs within its rated capacity.

The roller chain used in the "Pul-Lift" is specially designed and has an ultimate strength nearly five times the rated capacity of the hoist. Another feature is that it will operate equally well in horizontal or vertical position. Thus it can be used for both pulling and lifting and is suitable for almost any type of maintenance job. It also features Yale safety hooks. In case of severe overload, these hooks open slowly, without fracture, giving ample visual warning of danger and positive protection to the operator, the load and the mechanism.

For operation in close quarters and tight, out-of-the-way places, the "Pul-Lift" has a ratchet handle with a universal action. Short, easy strokes at any point within a complete circle permit operation in the most cramped of quarters. Possibility



of flying handle is reduced to a minimum by the self-actuated load brake of the "Pul-Lift." As the load is increased, brake pressure increases in direct proportion.

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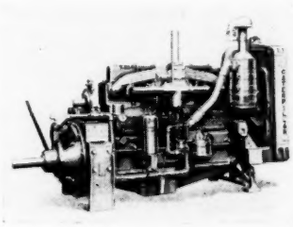
DIESEL ELECTRIC SETS, NATURAL-GAS ENGINES

Caterpillar Tractor Co., Peoria, Ill., has added two new models—the 88-41 and the 77-34—to its line of diesel electric sets, both powered by four-cylinder engines. The sets are said to be completely self-controlled, requiring no gadgets other than a circuit breaker. Easy to install, they can be set up and running in less than an hour after delivery. Inbuilt regulation enables the sets to pick up relatively large motor loads with a minimum of light flicker and voltage drop.

Because of the wide application of these sets, maintenance problems have been simplified by having the entire unit serviced by Caterpillar distributors; they are designed to be operated by personnel without special training. There are only three operating adjustments on the engines, none involving the fuel system. The generators are direct-connected rotating field type, available as three-phase, 60- or 50-cycle, and with a wide variety of voltages.

Three models of heavy-duty natural-gas engines are offered by Caterpillar. The Model 4600G is a six-cylinder unit and the 4400G is a four. Both of these



LOWEST LOADING MACHINE ON WHEELS

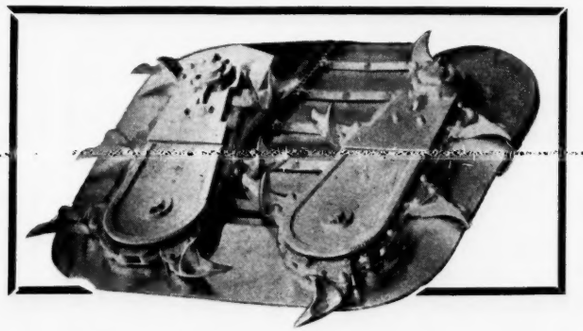
★ The new Clarkson loader which is suitable for heavy work in 38" coal and over, has many features which the coal operator wants in his drive to increase production and lower per-ton costs.

The flexibility of the new Clarkson loader is of primary importance to the coal operator. This loader is adaptable to very low, as well as high seams of coal—adjustable to loading a low, or a high mine car—flexible enough to meet your requirements and be operated with ease from one central point.

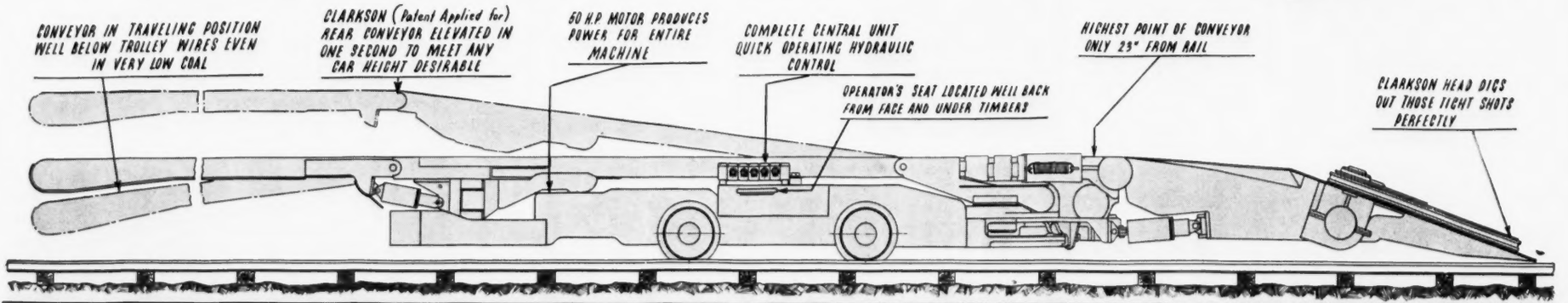
Many of the new features of the Type 24 latest Clarkson loader are illustrated in the sketch below. Let us give you full details on all these points—write today.

Type 24 Latest
CLARKSON LOADER
• • • • with entirely new features for easier, faster, and lower cost loading

• Same digging head, same loading capacity as Clarkson Type 50



Patents—2144871-2016564-2172360-RE 20883
Licensed under Forsyth 1,570,829 and other applications pending



CLARKSON MANUFACTURING COMPANY NASHVILLE ILLINOIS

engines have a bore of 4¾ in. and a 5½-in. stroke and they develop 74 and 48 hp., respectively, at 1,600 maximum governed r.p.m. A small four, the Model 3400G, with a bore and stroke of 3¾ and 5 in., develops 34 hp. at 1,650 r.p.m.

The three valve-in-head engines are designed for heavy-duty work with a minimum of maintenance. Heat-resistant alloy valve seat inserts are provided on all models. The engines have superfinished crankshafts with "Hi-Electro" hardened journals. The lubricating system provides efficient filtering and full pressure lubrication to all working engine parts. In addition there is an upper-cylinder lubricator to provide extra valve lubrication for use with dry natural-gas fuel.

A combination gas-gasoline carburetor is standard equipment, and though the engine will satisfactorily burn gasoline for short periods such as for starting purposes when gas is not available, the fuel system is set for the most efficient combustion of natural gas. The system includes a filter to clean the gas, with a regulator to handle gas pressure as high as 150 lb. at the supply. A complete manually operated manifold heat control is incorporated.

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SAFETY GOGGLE LENS

Univis Lens Co., Dayton, Ohio, offers the new Tulca safety goggle lens made of special nonshattering material. Each Tulca lens is less than half the weight of a tempered glass lens of equal dimensions and thickness, yet is said to stand up better under shock, abrasion and the thermal shock of molten metal.

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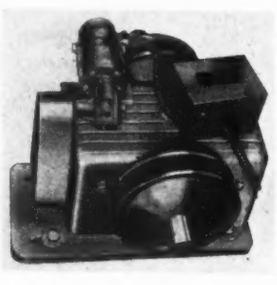
SPEED CONTROL

Ideal Commutator Dresser Co., Sycamore, Ill., offers a new series of "Select-O-Speed" transmissions equipped with electric motorized control. The new models supplement the standard line from fractional to 7½-hp. capacity that are equipped with lever type and handwheel control. The electric control is especially recommended where the drive must be mounted on the ceiling, back of or inside the equipment. A two-button switch controls the speed. Changes in speed adjustments, it is said, are easily made simply by pushing and holding either the fast or slow button until the desired speed is obtained.



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PILLOW BLOCKS

Ahlberg Bearing Co., Chicago, announces that its Series EC pillow blocks are now equipped with Neoprene (synthetic rubber) seals to protect the bearings and retain lubricant. These seal rings turn with the shaft and float in the housing. They

are of the labyrinth type, frictionless and long wearing, according to the manufacturer. Complete units consist of full self-aligning precision ball bearings mounted in one-piece Parkerized accurately machined housings. Compact and simple, it is said that the design lends itself to light and normal service where reliable yet inexpensive bearings are required.

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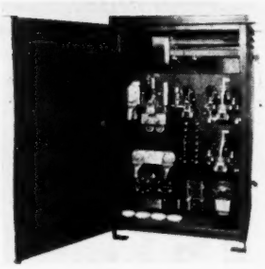
SECTIONALIZING SWITCH, PORTABLE SWITCHGEAR

For reducing copper distribution losses, improving mining feeder voltage regulation during normal operation, and sectionalizing faulty sections of the feeder system during fault or overload conditions, a d.c. sectionalizing switch for mining service has been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This unit is built in ratings up to 1,600 amp. at either 275 or 550 volts d.c.

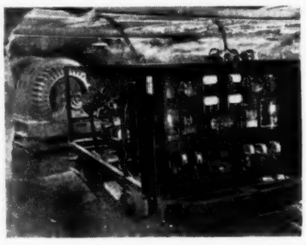
Mining bus often involves long feeders where short circuits near the end of some of its branch circuits will not cause sufficient current to trip the feeder breaker at the substation. The sectionalizer is applied at the points where the branch circuits are taken from the main feeder. Trouble on one of these branches is quickly isolated so that normal service is undisturbed on the



rest of the circuits. This reduces load outages and saves time in restoration of service after an outage.

The sectionalizer is housed in a substantial drip-proof steel box which can be locked up. Front and rear doors permit all parts to be easily inspected. The box is arranged for pole, wall or floor mounting. The contactor is said to be a proved circuit interrupter of strong and reliable construction with all parts specially treated to withstand underground service.

Westinghouse also offers new unitized automatic switchgear for controlling synchronous-motor-generator substations in mining service. This new equipment can be arranged for mounting on a portable truck or car so that it may be moved right along with the load center. Such portability reduces installation costs by requiring less length of distribution feeders; it also results in less voltage variation at the load. Available for standard operation from a 2,300-volt 60-cycle a.c. supply and with 275-volt d.c. output, it also can be obtained for other standard voltages.



The switchgear provides for the starting, stopping and running of the motor-generator set. Operation of the switch or push-button is the only manual one required. Starting and stopping sequences are fully automatic and are accomplished by means of control relays on the switchgear itself. Complete protection against overload, short circuit, faulty equipment and improper running conditions is provided during the full operating cycle of the system. Lightning protection and bearing temperature relays are available as optional protective equipment.

This switchgear is available for controlling both single- and double-unit substations. Optional on the double-unit systems is a "load-responsive" feature which automatically starts and stops both units in response to load demand. Provision is included for manually shifting the load-responsive equipment so that either unit may be the "lead-off" machine.

A new "De-ion" air circuit breaker designed especially for circuit-protecting applications indoors in central stations, power plants and in industrial plants is announced by Westinghouse. This new Type DH unit is available in ratings from 100,000 to 250,000 kva. interrupting capacity; 600, 1,200 and 2,000 amp., for operation on 2,500 and 5,000 volts, 60 cycle a.c.

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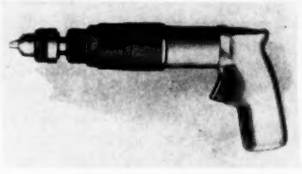
DRILLS AND GRINDER

Ingersoll-Rand Co., Phillipsburg, N. J., announces two new additions to its "Multi-Vane" drill line—sizes 00 and 0. These new tools are extremely light in weight, ranging from 1½ to 2⅞ lb. Numerous attachments can



be furnished to adapt them for light screw driving, nut running, close-quarter drilling, wire brushing, sanding, etc. Three different types of handles—straight, lever throttle or pistol-grip—are available.

I.R. also recently added a new "baby" air grinder to its line of pneumatic tools. This tool, called the size 00, weighs only 1¼ lb. and operates at 20,000 r.p.m. at 90 lb. pressure. It is built to take 1½-in.-diameter organic bonded or 1¼-in.-diameter vitrified wheels. Also available are various sizes of collets to take mandrel-mounted grinding wheels or small twist drills. Although originally intended to be used as a die grinder for toolroom and bench work, it is now being used by industry at large for innumerable light grinding jobs wherever metal must be removed from places that would otherwise be difficult to reach.